

The leader in network knowledge

# NetworkWorld

**DSL Deceit?**

PAGE 8

A lawsuit against SBC claims the carrier is not delivering promised DSL speeds.

August 21, 2000

Volume 17, Number 34

The network portal: [www.nwfusion.com](http://www.nwfusion.com)

## BUYER'S SAN switches GUIDE

### FEATURE

There's a SAN for every need. **Page 49.**

### REVIEW

Brocade's SilkWorm switches win our SAN switch test.  
**Page 52.**

### ONLINE

Our interactive Buyer's Guide chart includes SAN products from 23 vendors, [www.nwfusion.com](http://www.nwfusion.com),  
**DocFinder: 7625**

# Big boys give Linux push toward enterprise

*IBM, HP, Dell and Sun among the companies waving Linux flag.*

BY PHIL HOCHMUTH

**SAN JOSE** — Big announcements and large attendance signaled to the world that Linux may have come of age at the fourth LinuxWorld Conference & Expo last week.

The show, which saw 200 vendors and 20,000 attendees, featured high-profile announcements from big systems stalwarts IBM, Hewlett-Packard, Dell and Sun, and start-ups, such as Linux NetworX, all bent on making the Linux operating system as bulletproof as possible for the enterprise customer.

A little more than two years

ago, Linux existed mainly as a research project, but according to market researchers at IDC in Framingham, Mass., Linux was the second-most popular server operating system last year, behind Windows NT, taking almost one-quarter of the market with 1.3 million distributions shipped.

"Linux is starting to evolve as a complete system," says Bill Gleason, a systems manager who uses Linux for Rampt.com, a Los Angeles search engine company. Gleason says he was at the show looking specifically for Linux clustering products. "It's nice to see the big [tech-

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**THE LOWDOWN ON LINUX**

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nology vendors] getting involved more with its development," he adds, citing recent See **LinuxWorld**, page 16

## Online card fraud targeted

BY ELLEN MESSMER

Visa and MasterCard have separately drafted new plans to wage war against online credit card fraud, a costly burden for merchants that get fooled into accepting phony card numbers over the Web.

Visa last week trumpeted a

list of security "best practices" for e-merchants that accept Visa cards, requiring them to use encryption and firewalls to protect card data. In a different approach, MasterCard next year plans to require that credit card purchases on the 'Net include a special three-

See **Fraud**, page 72

## Q2 venture capital survey

**E-comm cools off; ASPs and optical net firms heat up.**

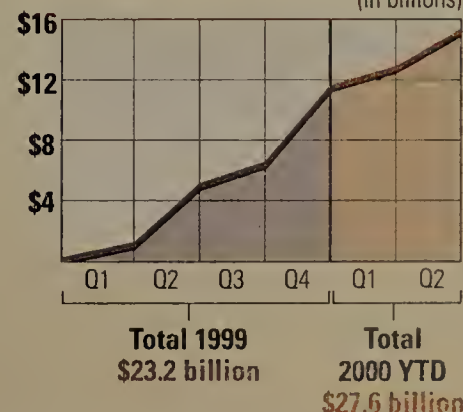
BY CAROLYN DUFFY MARSAN

The venture capital community remains bullish on the Internet economy, pumping a record \$15 billion into business services, network software and telecommunications start-ups in the second quarter of this year, according to the most recent PricewaterhouseCoopers/Network World Venture Capital Survey.

Despite a downturn in the valuation of Internet stocks that began in March, the second quarter saw a 20% rise in network-oriented investments over the \$12.5 billion spent in the first quarter of this year. Altogether venture capitalists have invested \$27.6 billion in network companies this year — \$4 billion more than was spent during all of 1999.

See **Venture**, page 71

**Venture funding in network start-ups**  
(in billions)



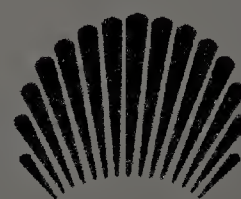
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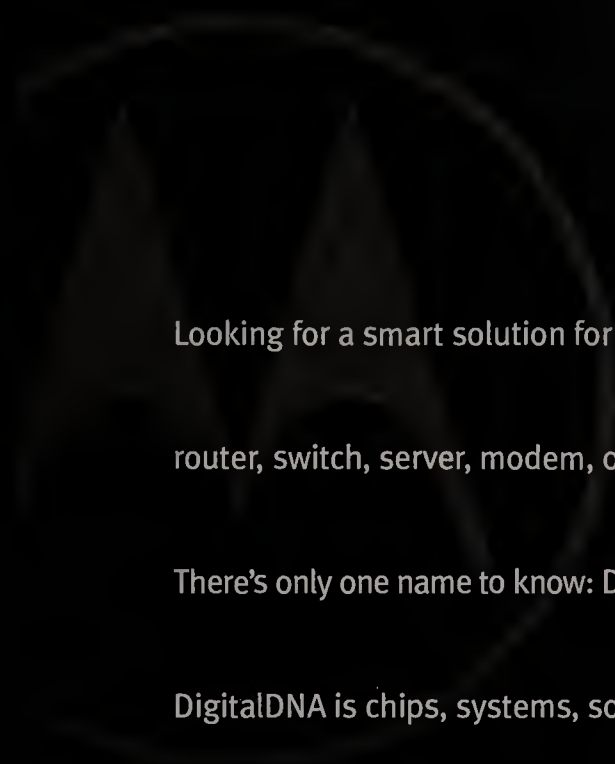
  
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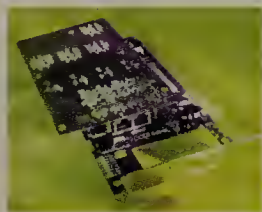




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World Bank's Pauline Ramprasad using Web to fight world hunger.

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Jeff Shapiro gets Cisco certified.

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## INSIDE intel

### FEATURE

*Intel is trying to transform itself from a chip maker to a broad-based provider of network equipment and Internet services. But analysts say the company is facing an uphill battle in these new markets.*

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CONTACT US Network World, 118 Turnpike Road, Southborough, MA 01772; Phone: (508) 460-3333; Fax: (508) 490-6438; E-mail: [nwnnews@nwn.com](mailto:nwnnews@nwn.com);

CIRCULATION: Phone: (508) 490-6444; Fax: (508) 490-6400; E-mail: [nwcirc@nwn.com](mailto:nwcirc@nwn.com); STAFF: See the masthead on page 12 for more contact information. REPRINTS: (717) 399-1900

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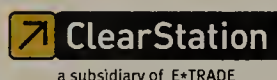
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#### Experts Exchange

##### *E-mail delay*

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#### **Defining Carnivore**

Has the FBI done a good enough job in describing its Carnivore wire-tapping technique? **DocFinder: 9539**

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#### BARNEY'S RUBBLE

*The best of the NetFlash daily newsletter*



#### **Dell is Linux's greatest ally, CEO says**

Recently, IBM has been acting like the biggest friend Linux has ever made. Now Dell is trying to steal the spotlight.

At LinuxWorld last week, the incredibly rich Michael Dell took a few potshots at the fabulously wealthy Scott McNealy, claiming that Solaris will be no match for Linux running on Dell servers. Maybe McNealy will now plug Dell's name into his automatic joke generator, which currently is only programmed to make fun of Bill Gates. **DocFinder: 9550**

#### **Microsoft cutting free phone support**

Does anyone remember Dbase IV — a steaming pile of software buggier than the set of "Survivor"? Right as sales of this monstrosity were starting to rise, Ashton-Tate decided to charge for support, which was unheard of in the late '80s.

Microsoft just made a similar move, limiting free support for Office and Windows to "two incidents." Heck, I have two incidents a day with Microsoft Word alone.

**DocFinder: 9551**

#### **Banned from the Olympics**

In the old days, the Olympic games were the pinnacle of amateur athleticism — and generally devoid of capitalistic excess. Today, we have U.S. basketball players worth millions stomping all over true amateurs from dinky little countries — and we call this sport.

Well, the International Olympic Committee took a break from handing out payoffs to figure out how it can make even more money. The plan? Protect lucrative TV deals by shutting out the competition, in this case, the Internet. **DocFinder: 9552**

— Doug Barney, executive editor, news

Sign up for this e-mail newsletter online. **DocFinder: 3850**

### COLUMNISTS

#### **Water Cooler**

*Security policies: Making the dreaded task palatable*

Writing security policies is easily the least favorite job of any IT manager. But Signature Series Senior Editor Julie Bort has some good news that could help. **DocFinder: 9540**



#### **Keeping Current**

*The Verizon strike's far-reaching net*

Columnist Fred McClimans has been incommunicado. Not by choice, but as a result of the Verizon strike. **DocFinder: 9541**



#### **Compendium**

*Looking to the future*

Adam Gaffin on why turning your clothes into networked devices could lead to a fashion no-no. **DocFinder: 9542**



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## NEWS BRIEFS, AUGUST 21, 2000

**Corel CEO Cowpland resigns**

Michael Cowpland last week resigned as president, CEO and chairman of embattled Corel to spend his time on "new start-up opportunities," according to a statement from Corel. The news had been expected, according to analysts, who pointed to the company's ongoing financial struggles as evidence that a change was needed at Corel's helm. Derek Burney, the company's executive vice president of engineering and chief technology officer, was appointed interim CEO and president. Burney has been with Corel since 1993. Cowpland, Corel's founder, will continue to serve as a director on the board and as a technology advisor but will not be involved in the company's operations, the Corel statement said.



**Corel CEO Michael Cowpland steps down.**

**High court gets DOJ/Microsoft brief**

The Department of Justice, as expected, last week asked the Supreme Court to decide on a trial judge's order to break Microsoft into two companies without the case first being heard in a lower appeals court. The Justice Department said in a brief that the case's "immense importance to our national economy" means the Supreme Court should take the case immediately. The government told the court that the length of the trial could be reduced by one year if the court agreed to take the case now. Last month, Microsoft submitted a brief recommending that the U.S. Circuit Court of Appeals for the District of Columbia hear the case first. The software giant has won two favorable rulings in the appeals court since the case began nearly two years ago.

**AT&T/BT speculation surfaces**

While it's not clear what road AT&T will take to improve its tumbling stock price, the telecommunications giant's options may be growing. According to *The Wall Street Journal*, AT&T and its Concert joint venture partner British Telecommunications may be talking about a merger, although AT&T denies the report. The speculation is being fueled by the fact that AT&T is exploring options, such as spinning off additional parts of its business to increase overall market value. Earlier this year AT&T created a tracking stock for its AT&T Wireless division, but the new tracking stock hasn't gone much above its initial offering price.

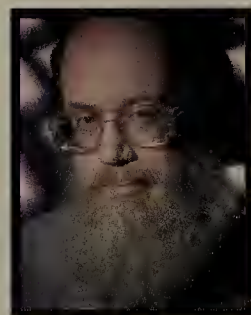
**Court nixes links to 'illegal code'**

In what some see as a significant ruling for

the future of the Internet, a U.S. federal judge last week issued a permanent injunction barring an online hacker publication from linking to Web sites where visitors can download illegal code, such as De-Content Scrambling System (DeCSS). If site operators know the offending code is available at linked sites and offer the links with the intent to facilitate the spread of the code, they are in violation of the antitrafficking provision of the Digital Millennium Copyright Act, ruled New York State District Court Judge Lewis Kaplan. The Motion Picture Association of America (MPAA) sued journalist Eric C. Corley, who also goes by the name Emmanuel Goldstein, after he and his employer, 2600: The Hacker Quarterly, decided to post the DeCSS source code on their Web site. DeCSS allows users to circumvent the Content Scrambling System, an encryption system designed to prevent piracy that's included by the MPAA on all DVDs. Corley's attorneys argued that posting of DeCSS was protected under the constitutional First Amendment guarantees of free speech and press. Those claims were denied across the board by Kaplan.

**Internet Society honors Bradner**

The Internet Society last week granted its Jonathan B. Postel Service Award for 2000 to Scott Bradner, a leading force behind Internet standards and a regular columnist for *Network World*. "We established the award to honor the late Jon Postel by recognizing his



**NW columnist Scott Bradner wins Postel service award.**

unselfish and substantial contributions to the Internet over a 25-year period," says Don Heath, president of the Internet Society. "Scott Bradner exemplifies the spirit of all that Jon brought to the Internet community, and his outstanding contributions have made this year's choice an easy one." Bradner has long

been a participant in the Internet Engineering Task Force and continues to serve on the Internet Engineering Steering Group as area director for transport.

**CRM revenue skyrocket**

Revenue in the customer relationship management (CRM) market grew at a feverish 71% rate and reached \$3.3 billion in 1999, a new study released last week concludes. Companies are focused on winning and retaining customers, and that emphasis contributed to the CRM market's growth, according to the report from IDC in Framingham, Mass. Revenue growth in the CRM sector is expected to continue at a healthy clip and become a \$12.1 billion market by 2004.

# SBC Communications sued over DSL speeds

*Class action suit claims telco's is not 'always on.'*

BY DAVID ROHDE

**HOUSTON** — Mega-telco SBC Communications last week was hit with a class-action lawsuit claiming it's "defrauding" DSL subscribers by limiting promised downstream speeds of at least 384K bit/sec to an actual rate of 128K bit/sec.

The lawsuit, filed by a computer technical support company in Houston and several of its customers, also claims that SBC's DSL service is not "always on" as advertised, but rather times out like an ordinary dial-up connection.

In a statement, SBC said it has to review the suit before responding in detail but noted that "there are many factors that can have an impact on the actual rate at which data is transferred online," including server speeds, protocol overhead factors and public Internet congestion.

But the plaintiffs point to e-mail and newsgroup downloads, where they allege they've noticed the 128K bit/sec cap. SBC's statement acknowledged that speeds for accessing newsgroup data are maximized at 128K bit/sec "in order to provide a more reliable service for all our customers using the newsgroups," though the plaintiffs claim that hadn't been disclosed.


By contrast, SBC said access to e-mail "and other Internet applications" are not affected by the 128K bit/sec cap. But the plaintiffs claim the network timeout — which allegedly occurs when users stop downloading Internet pages or using e-mail — is a deliberate capacity-saving maneuver by SBC rather than a random fault in the carrier network.

Many DSL proponents have claimed that this kind of potential user competition for bandwidth is only a problem with cable modems sharing a path back to aggregation devices. But that's a myth, says Philip Richards, vice president for Insight Research Corp. in Livingston, N.J. Many initial DSL service providers have indeed had to throttle back port speeds on their DSL access multiplexers (DSLAM) in order to avoid having their DSL networks seize up entirely.

"There is [bandwidth] concentration in the DSLAM, and in many instances, it's significant concentration, even more so than with cable," Richards says. "The rapid growth of demand doesn't give the engineers time to understand how the users are using it. They're still learning what kind of capacity they need."

Richards says he wouldn't be surprised if other DSL carriers are suffering the same learning curve, adding that could even be SBC's defense of the suit. But the plaintiffs point to SBC's Project Pronto, a \$6 billion initiative to install asymmetric DSL remote terminals near 80% of SBC's population. The suit claims Pronto publicity has caused hundreds of thousands of customers to sign up for DSL service that SBC is not ready to provision, forcing it to throttle back its network. SBC countered that "SBC is meeting our obligations to our customers."

The complete text of the lawsuit is available at [www.bafirm.com/petition.htm](http://www.bafirm.com/petition.htm).



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For the answer to this week's question and more net trivia, visit **Network World Fusion** and enter **2349** in the Search box.

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**This week's question:**

Who is generally credited with inventing corporate voice mail?

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# Novell financial troubles feed rumor mill

BY DENI CONNOR

PROVO, UTAH — Novell posted woful financial results last week amid fresh speculation about a possible takeover by IBM and musings from analysts as to how the company might make enough money to keep its technologies intact.

The company's third-quarter net income dropped 83% to \$8.6 million on revenue of \$270 million. That's measured against income of \$49.3 million and revenue of \$327 million for the same quarter last year, making Novell the third-worst performer on Standard & Poor's 500 stock index. Novell attributed its poor performance to midquarter shifts in its sales organization, weak sales in Europe and a continued decline in packaged software sales.

Early last week, Novell's stock took an upward bounce on rumors that IBM would acquire the company. Break-up and acquisition discussions dominated the conversations on several stock boards and among analysts. Since the earnings release, the stock has held

steady at \$10 per share.

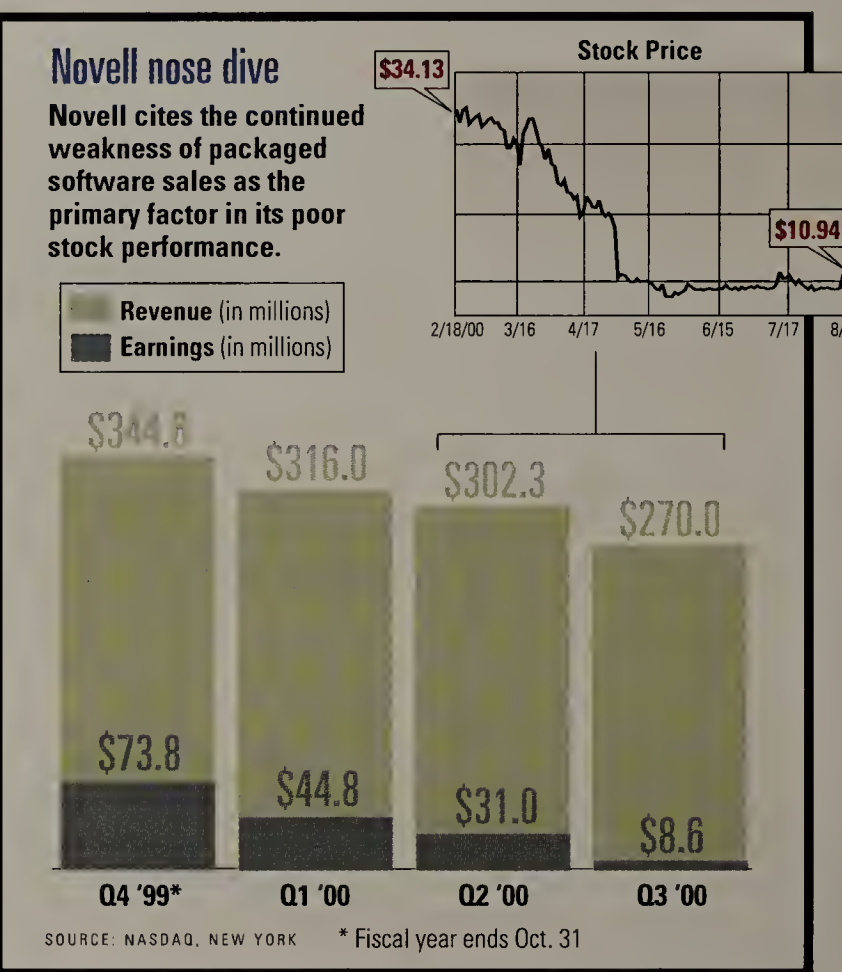
Novell's difficulties have some observers wondering whether a breakup of the company might help.

"There are obviously a lot of financial impacts in breaking a company up and having to recreate a corporate infrastructure," says Phil Schaecter of The Burton Group in Midvale, Utah. "Though that would be expensive, it would certainly be clearer in terms of market positioning and putting technologies out there that were clearly separated into their own business line."

Novell's caching technology, for instance, would be a good candidate for a start-up company, Schaecter says. "Showing a positive revenue stream the first year of operation in a quarter is not all that bad."

Novell's caching technology generated \$2 million in royalty revenue from OEMs in the third quarter, says Novell CEO Eric Schmidt.

"Any venture capitalist would be pretty happy with that. It would be valued higher as a technology if it were separate



from all the Novell baggage. And eDirectory outside of Novell would be more successful than inside Novell," Schaecter says.

However, splitting up the company would be thorny, says Bob Lam, an equity analyst at Bear Stearns in New York.

"There may be some technical problems because the company is based on NetWare," Lam says. "While Novell has been successful in expanding outside of NetWare into IP and other areas, it is still a NetWare company at heart."

More than 50% of Novell's revenue comes from NetWare.

Lam also believes Novell would be a good takeover target and should start looking around. "Novell has some exciting technologies in caching, single sign-on and security products," he says.

Schmidt rejects any talk of dividing the company. "People love to generate rumors," he says. "We don't have any plans that are specific enough at this time to talk about."

He acknowledges that Novell's management is stumbling through a learning slump. "It's been a costly, unintended learning experience, unfortunately," Schmidt says.

Time for learning may be running out, some say.

"You have to learn quickly," analyst Schaecter says. "The real question is does Novell know where it is really going here? Is there ever going to be an end to this?" ▀

## Novell touts future of GroupWise package

BY DENI CONNOR

PROVO, UTAH — Novell is expected to release the newest version of its collaboration/e-mail package, GroupWise, to beta testing this week and is already talking about how the product will evolve into a package for enterprise network customers and application service providers.

Code-named Bulletproof, the next version of GroupWise will enter testing this week, with a final shipping version expected by year-end. Next year, Novell will start working on the Copenhagen release of the product, which is aimed at companies that want to outsource their e-mail. Copenhagen will come out of the chute next summer, the company says.

Perhaps the most important feature of the Copenhagen release is the separation of management functions between

ASPs and customers that allows each to monitor and manage tasks they are interested in.

With Copenhagen, ASPs will be able to set up, install and manage post offices, optimize mes-

sage flow and troubleshoot problems with the message store via software. Customers will be able to use a different set of utilities to create their own e-mail accounts, reset passwords and determine the functions individual users are

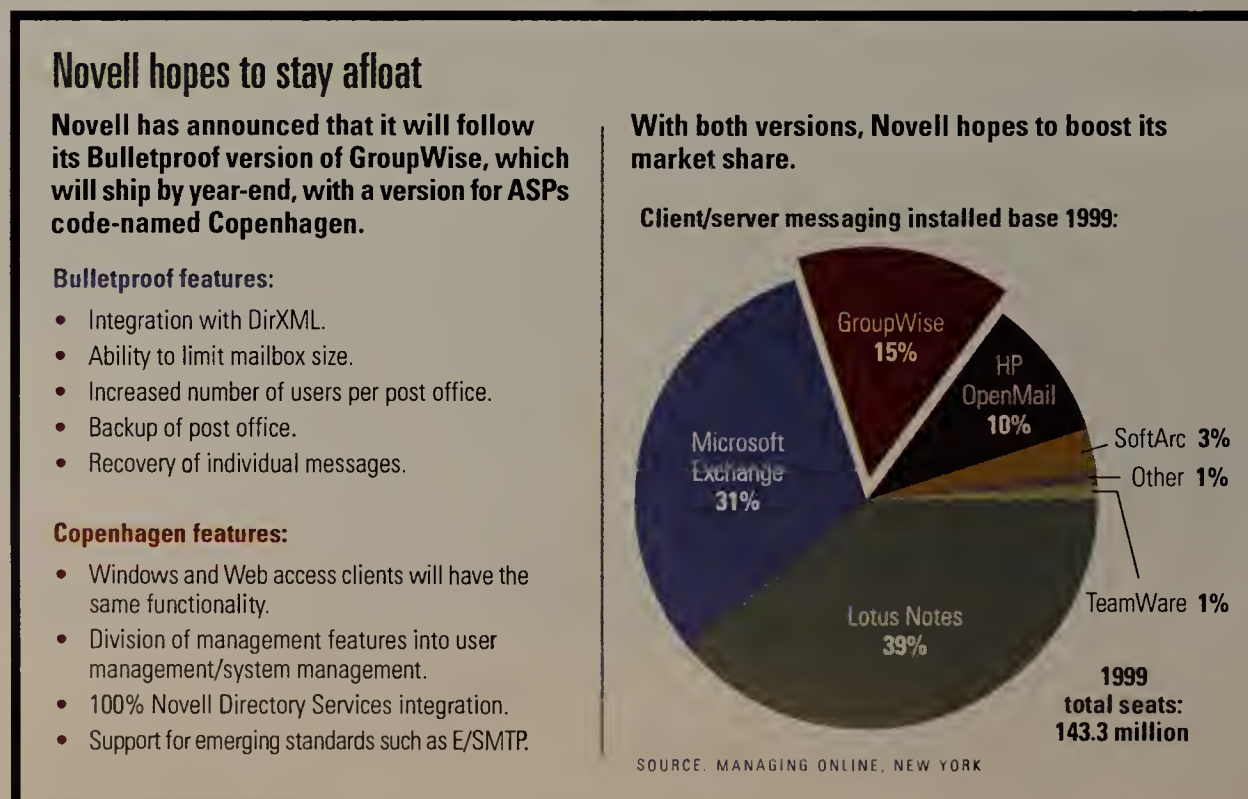
able to access.

E-mail outsourcing is relatively new field and currently appeals to only a minority of enterprise users, although the number is growing, according to analysts. Gartner Group in Stamford, Conn., estimates the market will reach \$1.3 billion by year-end.

"I can have someone who is an e-mail expert host this service for me and use a relatively small amount of monies," says a network manager for an electronic components manufacturer in the Midwest. "This type of ASP service adds value to my shareholders. Administering such an application internally does not really add value to my product."

With the Copenhagen release, users will also be able to do all the things they can with the Windows client from cell phones and other wireless devices. The WebAccess client lets users employ any wireless phone, pager, two-way radio or smart phone to send and receive e-mail.

See **GroupWise**, page 12





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# Service tests Web site scalability

BY MICHAEL MARTIN

ANDOVER, MASS. — NaviSite, a hosting firm and application service provider, is preparing to roll out a service that allows enterprises to see how their Web sites respond to particular volumes of traffic.

The testing will be part of the managed services menu NaviSite offers to companies that have their Web site hosted at the company's data centers.

Administrators can get response time information about their sites from free load-testing tools available on the Internet, but NaviSite's performance testing will produce more-detailed results, says Todd Michaud, practice manager for the performance testing service.

"With our integration, we can look at the server and see how the database is performing, whether there are some queuing issues, whether there are some long table issues, how the CPU and operating

system are performing," he explains. "We can check if there are disk bottleneck or swapping problems, how the application server is performing and whether we hit a queue limit of Navigator or Explorer we didn't expect."

NaviSite will be able to generate detailed information by combining Segue Software's SilkPerformer testing tool with BMC Patrol management software.

NaviSite will market the service to companies launching new Web sites as well as those launching new marketing campaigns on existing sites.

Enterprises signing up for the testing service will first have to tell NaviSite what actions typical surfers perform while on their site and how those users access the site. Based on that information, NaviSite will build a testing matrix and begin recording transactions.

The performance test will begin with a small number of transactions and scale up

## Testing to scale

**NaviSite's new service tests the performance of the following technologies as Web site usage scales up:**

- Databases
- Queuing
- CPUs
- Operating systems
- Browsers

until it reaches a breaking point. NaviSite will then do an analysis of why the site failed, make adjustments to allow the site to scale higher and continue testing and adjusting until the site performs as well as a company wants it to perform.

In the future, NaviSite will use the service to give its clients better service-level agreements on their Web sites' performance, says Jeff Loeb, a NaviSite vice president.

Pricing for the testing service begins at \$20,000 for tests of up to 500 concurrent users.

NaviSite: [www.navisite.com](http://www.navisite.com)

## GroupWise, continued from page 10

schedule meetings or tasks, and check their calendars.

Copenhagen will also fully integrate Novell Directory Services with GroupWise, and incorporate new messaging standards such as Transport Layer Security (TLS) and the extensions to Simple Mail Transfer Protocol. TLS provides secure transactions between hosts on the Internet.

The Bulletproof release includes support for more users, up to 6,000 per post office from 1,500, and the ability to limit the size of a user's mail box by storage capacity. The software also features XML support, which allows GroupWise to be linked to other systems and applications ([www.nwfusion.com](http://www.nwfusion.com), DocFinder: 9546).

In addition, administrators will be able to back up the mail system and recover individual e-mail messages. This version of GroupWise also has improved Web management and Web client software, and increases the security of the mail system for large global networks.

Pricing for the GroupWise versions has not been determined, the company says.

Novell: [www.novell.com](http://www.novell.com)

# Phobos NIC boosts e-comm security

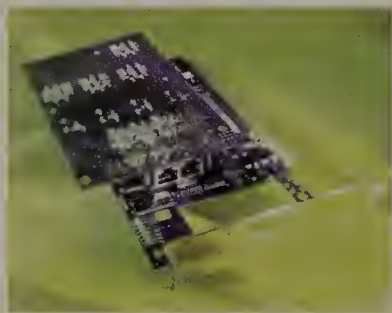
*In-Boost card promises to speed processing, transactions.*

BY APRIL JACOBS

Phobos this week will introduce a network interface card (NIC) aimed at speeding e-commerce transactions.

Phobos' In-Boost SSL can be installed in a Web server PCI slot to handle encryption and decryption processing. By using the Web acceleration NIC to control secure processing, network managers can free up their Web servers to carry out other types of processing and speed customer transactions on e-commerce sites.

Phobos isn't new to the Web acceleration market — the company already makes a NIC-based load-balancing product that helps serve up popular content requests to users. In the encryption/decryption processing product arena, Phobos will compete with Alteon, Intel and F5.



**Phobos' In-Boost SSL network interface card off-loads encryption and decryption functions from Web servers, boosting secure server performance by storing up to 256 keys and certificates.**

Observers say offloading the encryption/decryption processes of a secure transaction can go a long way toward speeding up a site's overall response time because those processes consume large amounts of Web server CPU power. Phobos says its In-Boost SSL can increase the number of secure transactions a server

can handle at any time by as much as 50%.

Phobos says tests by Networkshop, a network consulting group in Canada, show that transaction processing for a typical configuration of Pentium-based servers fell from 322 connections per second to just 24 connections per second when handling SSL traffic.

In-Boost SSL is a 10/100M bit/sec Ethernet NIC that plugs into the PCI slot of a Windows NT or Red Hat Linux server. Up to 256 keys and certificates can be stored on In-Boost SSL, simplifying the setup and management of security for multiple domain names, a benefit for ISPs and Web hosting firms offering secure servers for multiple users.

In-Boost SSL is available immediately for \$2,495.

Phobos: [www.phobos.com](http://www.phobos.com)

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## Corrections

The story, "Concert services will play to multinationals," (NW, Aug. 7, page 25) contained an error. Concert's IPSelect service is available now.

The review, "Stop 'em with a box," (NW, Aug. 7, page 48), contained an error in the NetResults graphic. The WatchGuard SOHO does allow password-protection of its configuration screens.



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# Industry group, Microsoft seek common ground

BY JOHN FONTANA

The development language fundamental to Microsoft's new .Net platform will be embraced next month by a source often at odds with the software maker. The result likely will be good for enterprise users.

The Object Management Group (OMG) at its September meeting plans to begin work on standardizing a link between Microsoft's yet-to-be-released C# (pronounced C sharp) development language and the OMG's Common Object Request Broker Architecture (CORBA).

CORBA is a specification for creating object-oriented systems, called object request brokers, that lets applications written in different languages and running on different platforms communicate over a distributed network such as the Internet. C#, which is expected to go into beta testing this year, is an object-oriented language for building Web-based

applications and services. It also will be integrated with 17 other languages. Observers say the CORBA-C# link will provide enterprise customers with another option for integrating applications and systems, especially for e-commerce.

"With the CORBA binding, there will be more interoperability choices," says Tom Murphy, an analyst with Meta Group in Stamford, Conn. "Developers can use C#, CORBA or both to integrate applications written in other languages." Murphy says the CORBA connection means developers could even use C# on non-Microsoft platforms.

But the CORBA-C# marriage also is likely to deepen the struggle between the 800-member OMG and Microsoft to define the technologies that will make up distributed-object computing, the fundamental concept behind CORBA and .Net. Microsoft's Distributed

## Language support

**The Object Management Group next month will start work on incorporating Microsoft's emerging C# development language into its Common Object Request Broker Architecture, which should provide more application integration options for enterprise users.**

### Languages CORBA supports:

- Ada
- C
- C++
- COBOL
- IDLScript
- Java
- Lisp
- Python
- Smalltalk

SOURCE: OMG, NEEDHAM, MASS.

Component Object Model (DCOM) is an alternative to CORBA, and the company's emphasis on the XML-based Simple Object Access Protocol (SOAP), a key integration technology for .Net, has so far been downplayed by the OMG.

Several OMG members, including Rogue Wave Software and Iona, plan to submit a request for proposal to the group next month to create a

standardized mapping of C# to the OMG's Interface Definition Language. The result is that applications written in any number of languages, including C#, Java, COBOL and Python, will be able to communicate via CORBA. They also plan to emphasize SOAP.

"Though C# will be good for .Net, you will also have to connect to other programs in the IT infrastructure," says Andrew Watson, vice president and technical director of the OMG. "We will allow C# programs to use CORBA services in a standard way."

Microsoft, however, has its own ideas about standards and is encouraging vendors of development languages to work with the European Computer Manufacturers Association (ECMA), says David Lazar, group product manager for .Net tools and services.

Microsoft has submitted C# to the ECMA for standardization. The software giant will

combine C#, which interoperates with many of the same development languages as CORBA, with SOAP and DCOM to create a so-called .Net framework.

"We would prefer that people use the .Net framework [over CORBA]," Lazar says. "We are doing work to foster deep integration between multiple languages, and the focus of that work will be through ECMA."

## Not a replacement

The OMG says the framework, especially SOAP, is by no means a replacement for CORBA. But the group is softening its initial criticism of SOAP. Next month the OMG will explore using SOAP to transport CORBA communications, says Barry Morris, CEO of Iona.

"My prediction is that the protocol used across the Internet will be SOAP," Morris says. "It is a very important part of building an enterprise global network infrastructure." ■

# Nortel buys integrated access device maker Sonoma Systems

*Sonoma's gear is designed to help carriers deliver high-speed managed services to enterprise users.*

BY JIM DUFFY

**BOSTON** — Nortel Networks last week announced plans to buy Sonoma Systems for \$540 million in stock, a deal that should enable Nortel's service provider customers to deliver high-speed managed services to companies.

Sonoma sells equipment that carriers put on customer premises to consolidate voice, data and video traffic over an ATM link to the public network. Such products eliminate the need for customers to subscribe to separate service providers for different service classes.

The carrier managed services market is projected to reach \$18 billion by 2002, Nortel says, citing data from The Yankee Group in Boston. The market is worth \$10 billion this year, Nortel says.

"The opportunity is explosive, and it's here and now," says

Steve Schilling, president of the access networks group at Nortel.

Sonoma, which is headquartered in Marina del Rey, Calif., and has operations in Marlborough, Mass., had revenue of \$7 million last year. The com-

pany was founded in 1998 and employs 128 people. The price Nortel is paying for Sonoma is in line with the value of the company had it gone public, Sonoma CEO Greg Koss says.

Sonoma's products integrate Internet access and other data

services, voice and video services onto an ATM trunk to the public network. ATM link speeds range from 1.5M bit/sec to 155M bit/sec.

The offerings compete with Ascend and Sahara products acquired by Lucent, and with Cisco's managed services products.

Nortel and Sonoma have had an OEM arrangement since February. Nortel labeled its three Sonoma offerings the Universal Edge 600 series. Sonoma's OEM customers also include Nortel competitors Alcatel, Siemens, and Cabletron's Riverstone and Enterasys subsidiaries. Sonoma will continue to support these customers and is placing the onus on breaking these engagements with them.

"Nortel needed to acquire Sonoma to secure long-term autonomy over the Sonoma technology," stated market tracker Current Analysis, of

Sterling, Va., in a report. "Sonoma needed to merge with Nortel to lock in Nortel's channels over the long haul."

Current Analysis notes that Nortel still faces challenges in differentiating its Sonoma offerings in the crowded integrated access device (IAD) market. The Sonoma IADs still lack support for symmetric DSL, which is an important differentiator in the next-generation IAD market, CurrentAnalysis states.

Nortel officials say they plan to add DSL to the Sonoma IADs but that ATM is the "transport of choice" for multiservice networks.

Nortel also plans to add Sonoma technology to its Passport ATM switches, Optera Metro optical switching and transport systems, and Succession packet voice gateways. Nortel also plans to integrate the subscriber management capabilities of its Shasta 5000 BSN routers with the Sonoma products.

Sonoma's customers include AT&T, WorldCom, Global One, Savvis, FiberNet and Madison River. The deal is expected to close in the fourth quarter. ■

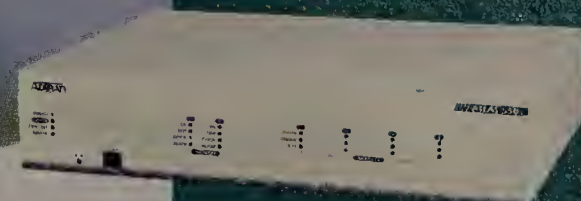
## PROFILE: SONOMA SYSTEMS

<b>Headquarters:</b>	Marina del Rey, Calif.
<b>Products:</b>	ATM integrated access devices
<b>Founded:</b>	1998
<b>Management:</b>	Gregory Koss, president and CEO; Larry Samberg, vice president of technology and chief technology officer
<b>Financials:</b>	\$7 million in 1999 revenue
<b>Investors:</b>	CrossPoint Venture Partners, Vantage Point Ventures, Lazard Technology Partners
<b>Customers:</b>	AT&T, WorldCom, Global One
<b>Employees:</b>	128
<b>Fun fact:</b>	Registered visitors to the company's Web site are eligible to win two bottles of Sonoma County wine.

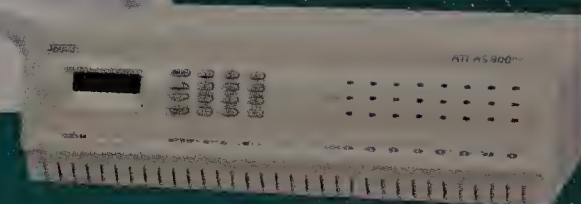


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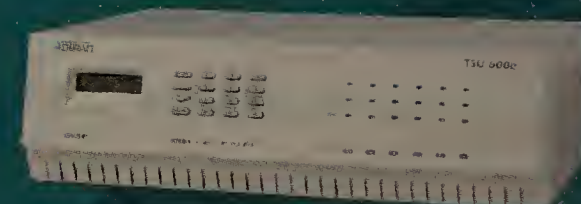
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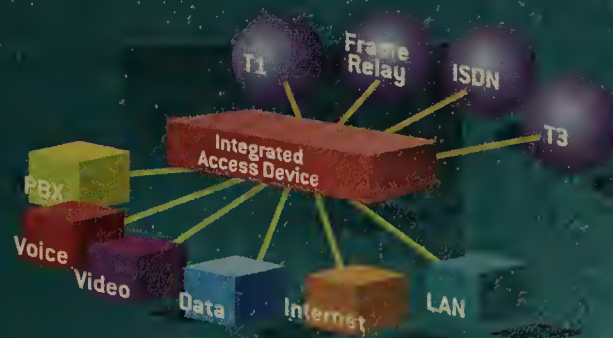
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# British firm invades U.S. with e-commerce suite

BY ELLEN MESSMER

**BROOMFIELD, COLO.** — British company Infobank has set up its U.S. office here and by the end of next month plans to release a version of its business-to-business e-commerce software that company executives claim will be a bargain at a half-million dollars.

According to John Ball, vice president of Infobank's new U.S. operations, the company's Web-based InTrade 5.0 offering will combine the three core e-commerce functions: e-procurement for controlling employee requisitions through online catalogs; a "sell-side" or "buy-side" component that a single seller or buyer can use for interacting with trading partners; and an exchange for commerce between multiple buyers and sellers.

"It's an e-hub in a single

## PROFILE: INFOBANK

<b>Location:</b>	Broomfield, Colo., with headquarters in the U.K.
<b>Primary product:</b>	InTrade software for setting up online marketplaces and controlling what employees can purchase from online catalogs.
<b>Founded:</b>	1994
<b>Management:</b>	Graham Sadd, CEO
<b>Funding:</b>	\$200 million from investors, including Goldman Sachs, Prudential and Merrill Lynch.
<b>Employees:</b>	270
<b>Fun fact:</b>	The Infobank InTrade e-commerce software supports 50 languages and currencies.

application," Ball says. A Web-based application that runs on any NT or Unix server, InTrade 5.0 relies on XML to exchange data between enterprise resource planning application formats, electronic data inter-

change and back-end databases.

InTrade 4.0 is limited to the e-procurement functionality, which puts it in competition with Ariba and a handful of others. If Infobank's new three-pronged application works as

advertised, the company will find itself competing against much of the e-commerce software industry dominated by U.S. vendors, including Commerce One, BroadVision, Ironside Technologies, Haht Software and InterWorld.

That doesn't seem to bother Jim Conning, Infobank's chief operations officer, who's confident there will be plenty of demand from midsize companies for InTrade 5.0.

He claims the price of a half-million dollars makes Infobank's software a bargain when compared with the millions of dollars needed to buy several types of e-commerce packages to get what InTrade 5.0 will have.

Business-to-business e-commerce software often looks like a rich man's toy. According to a recent study by IDC in Framingham, Mass., the typical cost of a software

license from Commerce One is \$650,000; Ariba, \$1 million; BroadVision, \$300,000; and InterWorld, \$365,000.

Infobank also plans to make InTrade 5.0 available as a hosted application, charging application service providers about 3% to 4% of any transaction fees they collect for its use.

The software firm says its customer roster includes Biotech Analytics, an online medical community called Vitals-986; a business-to-business company called Latinobanc.com; and Guilbert and British Telecom in the U.K.

Conning notes that with \$200 million in financial backing, the company is set to compete aggressively in the U.S. for the business of Fortune 1000 corporations and government agencies.

Infobank: [www.infobank.com](http://www.infobank.com)

**LinuxWorld,**  
continued from page 1

Linux strategies announced by Dell, Intel, IBM and Compaq.

"The more those guys get into [Linux], adding their own proprietary clustering software to the operating system," the more stable it will become, he says.

Hewlett-Packard displayed a version of its MC/ServiceGuard product for Linux at the show. Previously available for HP's



Unix servers, MC/ServiceGuard can proactively monitor the operating system and hardware health of individual nodes in a Linux cluster. It can also be configured to trigger alerts to management staff before server crashes occur.

Linux NetworX announced what it claims is one of the first vertically mounted cluster of Linux servers. The Evolocity product mounts up to 25 Intel or Alpha-based Linux nodes together, improving airflow around the individual nodes and letting them run up to 10 degrees cooler, the company claims. The cluster is managed

by the company's ClusterWorX software, which orchestrates the cluster nodes to act as a single server image on a network and includes failover support.

IBM announced a Linux cluster hardware/software package for high-availability Linux systems. IBM's Solution Series for Linux Clusters includes Netfinity servers running IBM's Linux Utility for Clusters, software that controls multiple servers as one logical node. The cluster package includes high-speed server interfaces from Myricom and Ethernet switches from Extreme Networks for connecting the cluster to a LAN. The package scales up to 64 nodes and supports Caldera, Red Hat, SuSE and TurboLinux distributions. The IBM clusters are available now and start at \$115,000.

Also making Linux clustering announcements were Silicon Graphics, which announced its Iris FailSave failover clustering software for Linux; Mission Critical Linux, which debuted its Convol Cluster, a two-node failover product for Linux on the IA64; and SuSE, which introduced SuSE Linux Professional Edition 7.0.

While Linux clustering products were abundant at the show, one attendee was not satisfied. "A lot of the vendors here claim

to have clusters for Linux, but they're really just providing [server] failover," says Brandon Allgood, a systems administrator for the University of California at Santa Cruz. Allgood says he needs a Linux cluster that can act as one logical system, where applications and computation processes are distributed across the cluster nodes."

But Linux "geeks" and "suits" alike are apparently still crazy about the open source operating system.

LinuxWorld sold out its exhibitor space, even with the show floor area expanded by 60% from February's LinuxWorld in New York. Show planners say they will move the West Coast show to San Francisco next year to accommodate its growth.

Enterprise network professionals and Linux enthusiasts roamed the San Jose Convention Center floor in fairly equal numbers. Dan Sokol, chief technology officer for Best-of-China.com, a San Francisco e-commerce Web company, was at the show searching for a low-priced Linux thin-client product.



**Dell CEO Michael Dell praised Linux for being a "disruptive technology."**

"Haven't found one yet," he says of the products he saw. School teacher Anita Malchiodi Albedi from Vallejo, Calif., was in search of Linux products for personal use and as a cost-saving alternative computer system for her school district.

Michael Dell, chairman and CEO of Dell Computer, lead the big vendors in supporting Linux with his keynote address. Dell noted some 10% of his company's servers ship with Linux support and praised Linux for being "a disruptive technology" that has shaken up the enterprise computing market.

Dell pledged to throw the weight of his \$25 billion company behind the operating system and force hardware vendors to develop more Linux device drivers for internal and peripheral PC and server components. A problem for Linux in the past has been the lack of support from hardware makers.

Besides clustering technologies, many firms announced products and partnerships:

• Veritas and Cobalt Net-

works announced a partnership in which Veritas will ship its Net Backup and Backup Exec server back-up and restore products with Cobalt's RaQ3 and RaQ4 server appliances.

• Eazel and Helix Code unveiled new GNOME-based Linux desktops aimed at making Linux easier to use. Both companies' booths drew large crowds of curious and gawking attendees. The two firms also joined Sun, Compaq, IBM, Red Hat, TurboLinux and others in forming the GNOME Foundation, aimed at unifying the Unix and Linux desktops with the GNOME desktop. Sun and HP also said they will ship GNOME as the default desktop for their respective Solaris and HP-UX Unix operating systems next year.

• Compaq announced it will soon ship Linux on its workstation, thin-client and iPaq desktop models. The company will also preload the latest version of Red Hat Linux, 7.0, on its ProLiant ML3300 and DL360 servers this year. ■

**Linux**

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# Infrastructure

**TCP/IP, LAN/WAN Switches, Routers, Hubs, Access Devices, Clients, Servers, Operating Systems, VPNs, Networked Storage**

## Briefs

Remote connectivity vendor **Perle Systems** last week introduced modem-pooling software for Linux. Perle 833 Access Servers software eliminates the need to attach modems to each workstation that needs to access the Internet or other remote locations. The software can be shared by Linux, and Windows 95, 98, NT and 2000 workstations, and make Internet access possible by rerouting data traffic from Linux applications destined for a PC's Component Object Model port to a server modem pool. The software is available for free from Perle Systems at [www.perle.com](http://www.perle.com).

**Red Hat Software** last week agreed to acquire **C2Net Software**, the developer of the Apache-based Stronghold Web server, for about \$44 million in stock. The Stronghold Web server will bring security to Red Hat's product family as it lets customers securely conduct transactions over the Internet. This is the fifth acquisition Red Hat has made since going public. The company acquired WireSpeed Communications, Bluecurve, Hell's Kitchen Systems, and Cygnus Solutions.

Red Hat: [www.redhat.com](http://www.redhat.com)

**Toshiba** entered the storage market last week with the introduction of a storage array for mid-size to large businesses. The Magnia ESA4000 external array features Fibre Channel and SCSI connectivity and redundant, hot-swappable fans, cards and power supplies. The array has a storage capacity ranging from 90G bytes to more than 1.4 terabytes, contains Ultra2 SCSI controllers and supports RAID Levels 0, 1, 3, 5, 0+1 and 10. The Magnia ESA4000 uses 18 or 36G byte drives and starts at \$24,400. It will be available at the end of the month.

Toshiba: [www.computers.toshiba.com](http://www.computers.toshiba.com)

## Storage services on tap from Arsenal

*Company to provide online storage, data mining and application services.*

BY DENI CONNOR

**A**rsenal Digital Solutions last week announced its first set of managed storage utility services that provide enterprise customers data storage, mining, analysis, sharing and collaboration capabilities.

Once a customer leases storage space at an Arsenal Internet data center, Arsenal uses software that lets the customer share and move that data to business partners or other employees and mine, analyze, crunch and derive additional data from it.

The company will develop software and applications that quickly compresses and transports data, and lets it be shared, analyzed and mined. Arsenal targets dot-com and e-business companies that deal with massive stores of data from medical imaging, records management, geographic information systems, publishing and online learning.

"Storage, storage management, monitor-

ing and backup are components Arsenal Digital has supplied for us," says Susan Rodgers, senior segment manager for application service provider Alltel in Little

Rock, Ark. "We chose Arsenal Digital because their offering is flexible and can handle the requirement of working on See **Arsenal**, page 22

### PROFILE: ARSENAL DIGITAL SOLUTIONS

<b>Location:</b>	Durham, N.C.
<b>Service:</b>	Storage and application service provider.
<b>Description:</b>	Company stores data online and makes it available for moving and sharing.
<b>Founded:</b>	August 1998
<b>Founders:</b>	Kevin Pollard and Lee Bryan
<b>Founders' backgrounds:</b>	IBM, CACI and Freeport McMoran
<b>Company officers:</b>	Kevin Pollard, Chairman and CEO; Geoff Sinn, president and chief operating officer; Steven Horan, senior vice president and chief financial officer
<b>Venture backing:</b>	Southeast Interactive Technology Fund, CIT, Barnard & Co., Task
<b>Fun fact:</b>	"The barrel" — The company's term for when someone is in deep trouble.
<b>Web site:</b>	<a href="http://www.arsenaldigital.com">www.arsenaldigital.com</a>

### IN-SITE: Lessons from Leading Users

## Software firm grows into IP telephony

BY PHIL HOCHMUTH

**C**utting costs drives many businesses to install a new technology, such as LAN telephony; advanced features brought by the new technology are sometimes just a bonus.

This was the case for RoweCom, a maker of software that helps businesses buy research books, journals and periodicals online.

The Cambridge, Mass., company experienced furious growth recently, witnessing more than \$300 million in sales from \$12 million during the past three years, along with doubling its staff and going public last year.

RoweCom's growth forced a major phone system upgrade. Jumping from 90 to 200 phones proved to be one of the biggest growing pains, according to Vice President and Chief Technology Officer Walter Crosby.

Nortel Networks proposed an upgrade of his small-office Nortel PBX. "I looked at the bid and said, 'this is insane, you guys are nuts,'" he says.

Nortel's proposed \$200,000 PBX upgrade, which did not include phones, was enough to make him look for an IP telephony alternative.

"I just said 'I'm sorry ... but I've bought my last PBX,'" Crosby says.

Crosby looked at other IP PBXs and phones, including Cisco's Selsius system. He was more impressed with 3Com's

gear, specifically for the NBX phones, which were "more robust" than the others. Voice mail on other boxes was also not supported well enough, he adds.

RoweCom now has four 3Com NBX 100 IP PBXs: one for RoweCom's Cambridge headquarters, two for its Westborough, Mass., operations office and one for the company's software development facility in London, Ontario. The three facilities are linked via T-1 lines. 3Com NBX IP phones in the facility plug in to SuperStack II 3300 switches, which are segmented from the data traffic on the network. The switches are also configured with 802.1p quality-of-service support that keeps the voice and data traffic running smoothly.

The 3Com NBXs cost a little less than \$6,000 (without phones) for a 48-user box, a price Crosby likes. What pleases him just as much are the unified messaging features the NBXs provide.

Each one has its own Internet Messaging Access Protocol (IMAP) server software, which lets the firm integrate any standards-based e-mail server. Crosby says IMAP features in Microsoft Outlook integrate well with the NBX, allowing for voice mail to be downloaded as a WAV sound file attachment.

"When [RoweCom users] are on the road," Crosby says, "their e-mail just picks up the phone mail right there as well. That's a popular thing."

See **RoweCom**, page 22



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Application Management

Network Management

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Real World Interface™

Performance Management

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UNIX OS/2

Windows NT

Windows 98, 95, 3.1, CE

NetWare

## EXTENSIVE PLATFORM COVERAGE

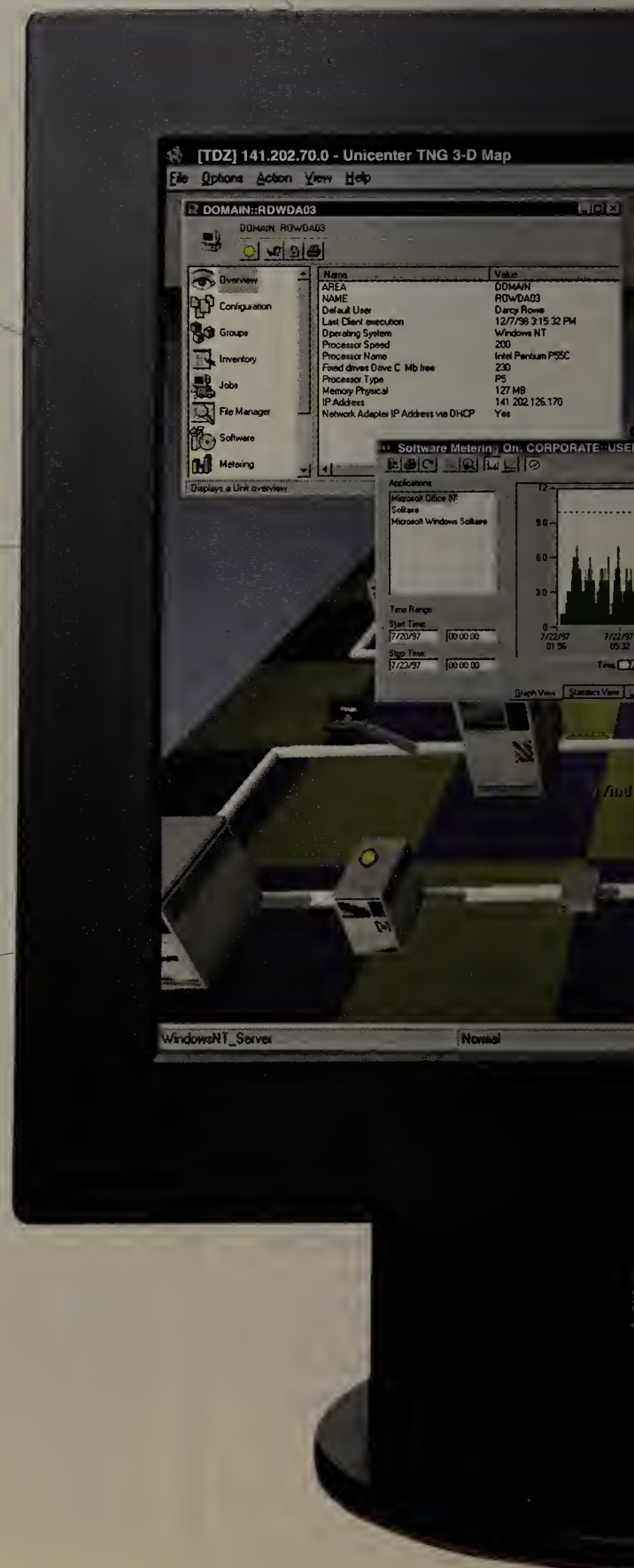
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Remote Reboot

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Software Maintenance

Software Inventory

Y2K Compliance Check

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Hardware Inventory

Configuration Management

Financial Tracking

Policy-Based Management

Historic Analysis

Hands-Free OS Installation

Roaming Users Support

## SOFTWARE DISTRIBUTION

Broadcasting

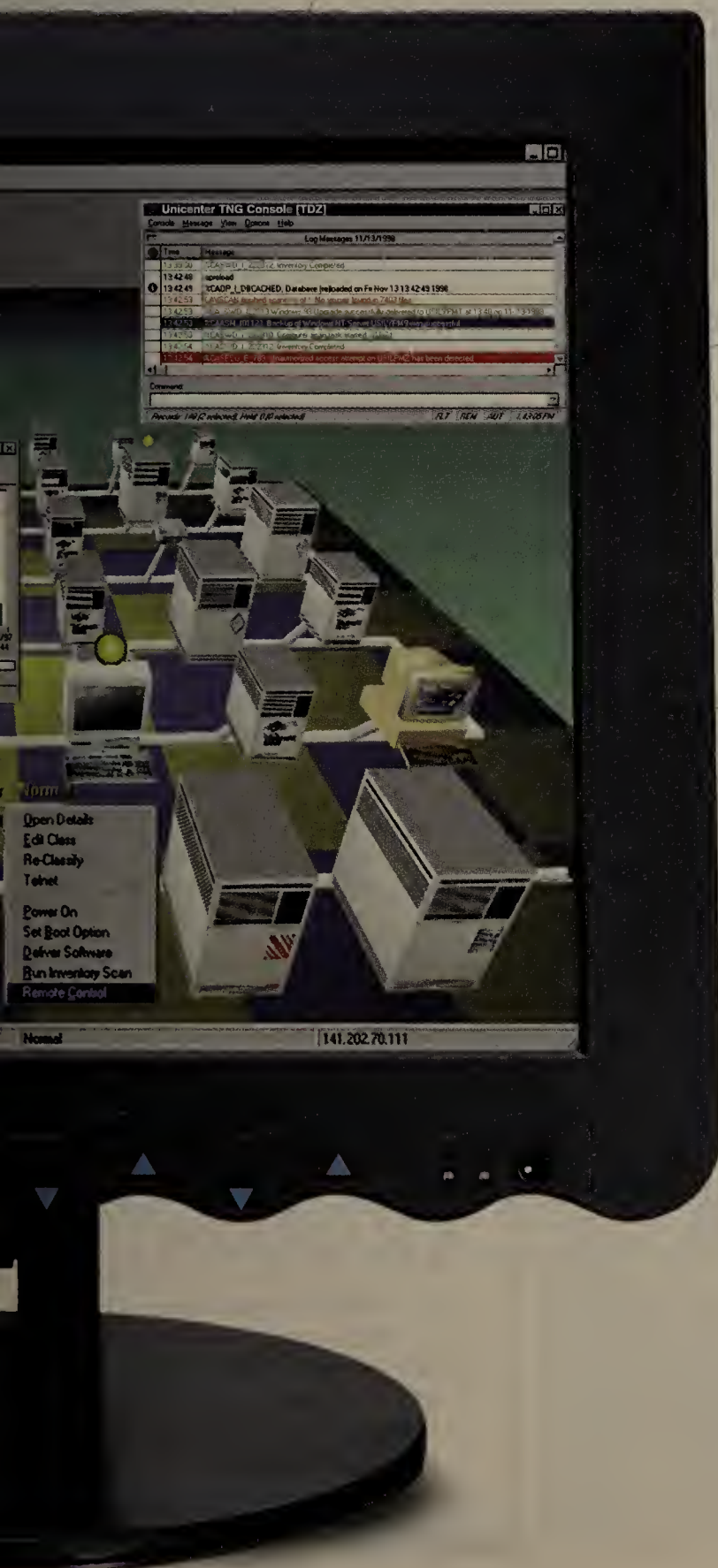
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Tolly on Technology . Kevin Flood

## WIN 2000 FORECAST: BLUE SKIES OR BLUE SCREENS?

**R**eliability, availability and Windows 2000.

Microsoft would have us believe these three words were destined to go together like, "Baseball, apple pie and Chevrolet." In Chevy's case, however, I don't think General Motors' appeal made any difference to the company's bottom line — customers made their purchase decisions based on performance results. If Microsoft's destiny is determined in the same way, it could be facing an uphill battle.

Windows NT users, with blue screens burned into their retinas, applauded Microsoft's emphasis on reliability with Windows 2000. Finally, all the bubble gum and duct tape that bandaged Windows NT together with various service packs and patches would be removed, and users would have a clean, shiny, new, blue-screen-free operating system. Right?

Unfortunately, those of us who have peeled the wrappings off the

new package have discovered residue from the NT bubble gum and duct tape, along with a few new wrinkles. Just scratching the surface of the mountain of Win 2000 reliability features recently resulted in a disappointing case of déjà vu.

In Tolly Research experiments assessing the capability of server-port aggregation software to increase Fast Ethernet throughput to Win 2000 servers, engineers discovered that modest traffic loads (three or more simultaneous file uploads) brought the server to its knees. When configured with Intel PRO/100 Server Adapters and running Intel's Adaptive Load Balancing software, we observed blue screens galore.

Webster's dictionary defines reliability as the, "extent to which an experiment, test, or measuring procedure yields the same results on repeated trials." In that regard, the server-port aggregation was extremely reliable — it crashed in

every trial. That wasn't after 10 minutes of nonstop uploads — it crashed immediately.

In its knowledge base, Microsoft does acknowledge that, "Under certain circumstances when you are using TCP/IP for network communication, your computer may stop responding [hang] . . . Microsoft has confirmed this to be a problem. . ."

This acknowledgement undoubtedly will give you a great deal of solace as you repeatedly reboot your server.

In fairness to Microsoft, we did not observe the same catastrophic result when using 3Com network interface cards and software on a Win 2000 Server. However, we couldn't detect any bandwidth aggregation, either. I guess you have to pick your poison.

Microsoft points to a number of recent studies regarding Win 2000 reliability, but they almost exclusively focus on Win 2000 Professional, not Windows Advanced Server,

which is supposed to support strategic mission-critical applications. While desktop reliability is a noble goal, server reliability is of far greater significance.

Because of the requisite interplay of the network operating system with third-party hardware and software, ensuring server reliability can be a daunting task. It is incumbent upon Microsoft, as the end-to-end solution provider and guarantor of "reliability," to bring about dependable interoperability.

Microsoft, no doubt, will chip away at pesky Win 2000 idiosyncrasies (like server crashes) until they legitimately can proclaim high reliability. The question facing those considering the transition to Win 2000 Server is, "When?" Early indications are the answer is, "Not yet."

*Flood is chief technology officer of Tolly Research. He can be reached at [kflood@tollyresearch.com](mailto:kflood@tollyresearch.com).*

### RoweCom,

continued from page 19

Crosby also plans to introduce integrated IP telephony features in a call center he's building with customer resource management software from Onyx Software.

Agents in RoweCom's 50-person call center will soon have customer profile information appear on their PC screens automatically via the NBX's integrated phone number-recognition feature. The NBX hooks into the Onyx software via the Microsoft telephony API.

Because RoweCom was an early adopter of the NBX product, Crosby says the system had its kinks to be worked out, such as duplicate media access control addresses and some less-than-optimal voice quality.

"We had to go through a lot of difficulty to make the thing work, but it's been quite a learning experience," Crosby says.

"Our staff probably went through the worst of what you would hear, but now when you pick up the phone, it's pretty clean and clear. We don't get so many complaints anymore," he adds. ▣

### Arsenal,

continued from page 19

multiple platforms."

Alltel designs, implements and manages the technology infrastructure of a company's Internet- and intranet-based applications.

Formed two years ago from a merger of Access Data Direct and content developer OneRoom Systems, Arsenal saw an advantage of storing large amounts of data at an Internet data repository. Files of more than one megabyte in size are difficult to share via e-mail and likely candi-

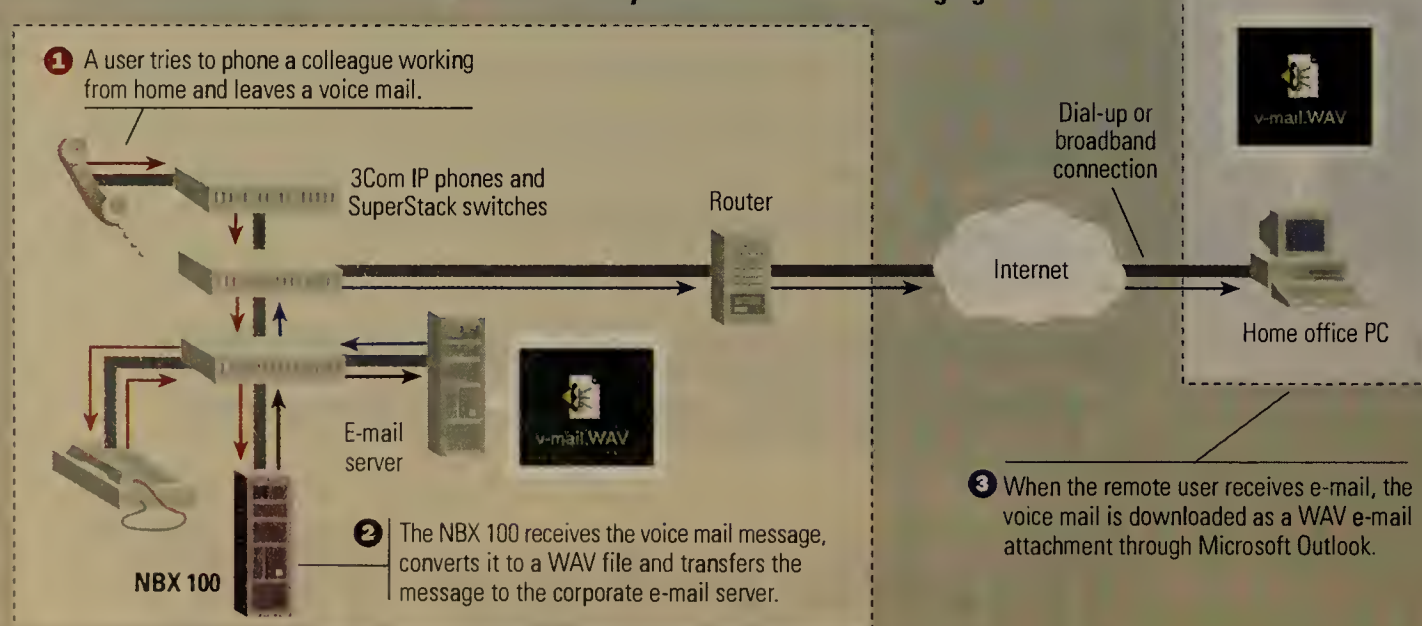
dates for Internet storage, where they can be easily accessed from any location. The numerous servers and storage arrays used in an Internet data center could also be harnessed to process that data and use it in applications a customer required. For instance, the company will develop applications for predictive modeling of data and use XML to draw that data from back-end databases and data stores.

Arsenal Digital can store, back up and manage customer data in Net data centers. The company is working on the send engine, encryption and authentication technologies that let the customer move the data stored in the Internet data center between partners or employees. The applications used to mine and analyze data stored in Internet data centers will be implemented by the second quarter of 2001. Arsenal charges on a gigabyte-per-month basis for its online storage service.

Arsenal: [www.arsenaldigital.com](http://www.arsenaldigital.com)

### Getting the message

How RoweCom uses 3Com's NBX 100 IP PBX to unify voice and e-mail messaging.



## THE STORAGE ARSENAL

Arsenal Digital claims it can make storage as "plentiful" and "transparent" as our use of electricity. Read the company's white paper on how it will accomplish this.

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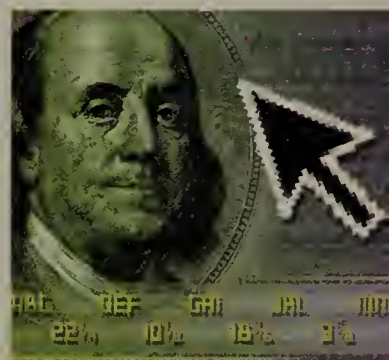


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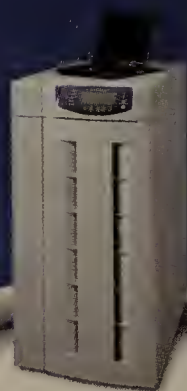
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\* Source: Media Metrix, May 2000





**It's hard to explain to a  
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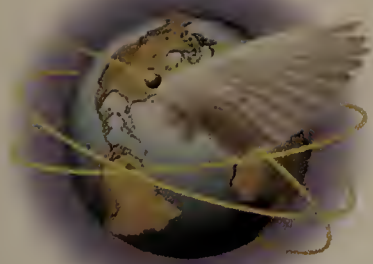


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# Carriers & ISPs

The Internet, Extranets, Interexchange  
and Local Carriers, Wireless, Regulatory Affairs

## Briefs

AT&T launched its Business Ready Dedicated Hosting Service last week. The service includes a Cobalt RaQ Web server appliance, ShopSite Lite and CyberCash Cash Register Internet payment software packages. The servers are hosted at AT&T's 13 Internet data centers. AT&T says it can have customers up and running in 30 minutes. The service is available now and costs \$295 to \$795 per month depending on configuration.

AT&T: [www.att.com](http://www.att.com)

Long-distance carrier Broadwing has filed to become a competitive local exchange carrier (CLEC) in seven states plus Washington, D.C. It's currently a CLEC in New York, and will add Florida, Illinois, Indiana, Michigan, Kentucky, Ohio and Texas. Broadwing has roots in two of those states: It was formed by the merger of Cincinnati Bell of Ohio and Texas backbone carrier IXC Communications in November 1999, and is now targeting companies and service providers for comprehensive voice and data offerings.

Broadwing: [www.broadwing.com](http://www.broadwing.com)

No sooner have real estate-based carriers — so-called building local exchange carriers (BLEC) — appeared on the scene than they've begun merging. BLEC Everest Broadband Networks of Fort Lee, N.J., last week acquired BLEC Metrocomm International of New York for an undisclosed amount. Everest claims 150 million square feet of commercial, residential and hotel space under contract to install broadband traffic-aggregation nodes, including New York's Chrysler Center, Chicago's Merchandise Mart and Los Angeles' Pacific Design Center.

Everest Broadband: [www.everestbroadband.com](http://www.everestbroadband.com)

## Revolving door spins again at C&W

BY DENISE PAPPALARDO

The third time was no charm for Cable & Wireless North America in its quest to find the right top executive.

Last week Cable & Wireless announced that Wharton "Zie" Rivers, president of its North America division, is leaving the company "to pursue other opportunities." Alan Gibbs is taking over as president and is the fourth person to hold the highest executive position in the two years since the company acquired MCI's Internet business.

Cable & Wireless has various explanations for the departures, but a likely culprit for the instability is the division's disappointing growth record, says Steven Harris, an analyst with market research firm IDC in Framingham, Mass.

MCI's Internet business reported \$131.2 million in business access service revenue for 1997. MCI had 7% of the market and was the third-largest ISP, Harris says. At the end of 1999, Cable & Wireless had \$147 million in business access service revenue and 2.8% market share, making it the sixth-largest ISP, he says.

### Doing the executive shuffle

In just more than two years since Cable & Wireless acquired MCI's Internet business, three CEOs have resigned.

- Richard Yalen left Cable & Wireless five months after the MCI acquisition.
- Dennis Matteucci replaced Yalen in December 1998 but resigned less than one year later.
- Wharton "Zie" Rivers replaced Matteucci in October 1999 and as of last week, he's out the door.

Cable & Wireless is reporting more business access service revenue in 1999 compared to MCI in 1997, but not much, especially compared to competitors.

"In fact, UUNET has more than doubled its business access services revenue in the same time period," Harris says.

The newly appointed Gibbs will have an uphill battle to grow Cable & Wireless' business as aggressively as competitors, and he says that's where his efforts will be targeted.

"My goals are to execute on the company's plan to build Cable & Wireless USA and make it better than it is," Gibbs says. "We're midfiscal year, and I plan to deliver to the company our revenue and profit commitments."

Gibbs may have better luck than the previous leaders of Cable & Wireless North America because he's coming up through the ranks, although he's only been with the company since 1998. Gibbs was most recently senior vice president and program director of Cable & Wireless Global Operations. He joined Cable & Wireless as the CEO of its Global Card Service business, which has since been sold.

Gibbs is taking over as president less than one year after Rivers joined Cable & Wireless last October. Rivers took over after Dennis Matteucci left the company. Matteucci, who held the title of CEO, also left before finishing one year of service. Matteucci took over as CEO when Richard Yalen left only a few months after Cable & Wireless acquired MCI's Internet business. "I intend to be in this position for a while and look forward to it," Gibbs says. ■

## Covad sets sights on international opportunities

DSL firm now has partners in Japan, India to match similar efforts by competitors.

BY MICHAEL MARTIN

SANTA CLARA — Covad Communications became the latest broadband provider to test the overseas DSL waters when it launched an international subsidiary last week to sell services in major foreign markets.

Covad also unveiled a strategic alliance with NTT Communications of Japan and Japanese venture capital firm Ignite Japan KK. The three have formed ACCA Networks, which will sell broadband services in major Japanese metropolitan areas. The Japanese deal follows Covad's investment in Dishnet DSL, a broadband provider in India.

Adam Guglielmo, a DSL analyst with TeleChoice in Tulsa, Okla., says Covad has been relatively slow in entering the international broadband market.

"NorthPoint Communications kind of got the jump in a big way when they part-

nered with Versatel," he says. NorthPoint and Versatel Telecom in Amsterdam teamed to form European broadband firm VersaPoint in June.

Other major U.S. broadband companies also have an international presence, Guglielmo notes. Qwest Communications is working with a European partner to build a European version of Qwest, and @Home has a presence in Belgium, Luxembourg, Germany, Japan and Australia.

The main goal of Covad's new subsidiary, Covad Communications International, is to export the DSL expertise Covad has developed in the U.S. to other countries, says Kyle Moody, vice president of Covad International. In particular, Covad believes its Operation Support System (OSS) will let the company enjoy global success.

"It's viewed as a key strategic asset and differentiator for us in the U.S.," Moody says.

What sets Covad's OSS apart, Moody says, is its "zero touch" provisioning. Covad only has to place an order for one of its DSL end customers once, and the order will flow through to the incumbent local exchange carrier involved and any necessary ISPs. ■

[www.nwfusion.com](http://www.nwfusion.com)

## COVAD OPERATIONS

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Eye on the carriers . David Rohde

## LOOKING FOR SBC OVER THE HORIZON

**W**elcome to Eye on the Carriers' third annual "When is SBC going to compete with the other Bells?" sweepstakes. Pay close

attention because there's a special prize at the end.

In May 1998, SBC Communications shocked the world by announcing it

was buying Ameritech. Although SBC has since promoted other "benefits" of this huge roll-up of near-monopoly assets, the original announcement

focused on one breakthrough. SBC said following the merger it would enter 30 markets outside its region as a competitive local exchange carrier (CLEC) against the other remaining Bells.

In mid-1998 and mid-1999, I asked SBC for details of its CLEC buildout — number of route miles, types of switches, that kind of thing. They had no answers. At that point the promise was political bait to please the regulators.

But when the Ameritech takeover was approved last October, the Federal Communications Commission gave SBC three years to fulfill its promise, with an interim deadline of October 2000 to put switches in at least three of the 30 cities. When I called SBC this year, it finally had something to talk about.

SBC recently placed two switches in its initial cities: Boston, Miami and Seattle. One platform is the 5ESS, Lucent's classic circuit switch for local telephone companies. The other is the CBX 500, Lucent's ATM switch anchoring a host of data services, including frame relay. In Miami and Seattle, the switches are collocated in facilities of SBC's long-distance partner Williams Communications. In Boston, it is in SBC's Cellular One central office.

In May, SBC announced it was buying local dark fiber nationwide from Metromedia Fiber Network and, for Florida, FPL FiberNet. SBC will have 50,000 route miles of OC-3 and OC-12 capacity available via these agreements. Initially, SBC may rent local loops from the incumbent Bells, but over time it will try to reach customers via this fiber. SBC will also do a network-to-network interface with Williams' national ATM net.

Progress? I wonder. If the FCC tells SBC to enter three out-of-region markets by October 2000 — nearly two-and-a-half years after SBC made its original promise — why does SBC do that as if becoming a CLEC is like being dragged to the dentist?

SBC needs to get its marketing act together. Whenever I call a toll-free phone number for SBC Telecom, the company's CLEC division, I either get a recording to leave my name and phone number, or a generic customer service line.

You can always leave e-mail. I did so in June and got a nice message back saying SBC local service is not available in Washington, D.C., but it will contact me when it is. So why don't you try? Go to: [www.sbctelecom.com/ContactUs/Bus\\_Feedback](http://www.sbctelecom.com/ContactUs/Bus_Feedback). First one outside of Boston, Miami and Seattle who gets a message back that SBC is ready to replace your local Bell's lines wins your choice of a *Network World* mug or mouse pad! Stay tuned for the results.

*Robde is managing editor of The Edge section of Network World. He can be reached at [drohde@nww.com](mailto:drohde@nww.com).*

## Tie the circuit switched world into the IP universe



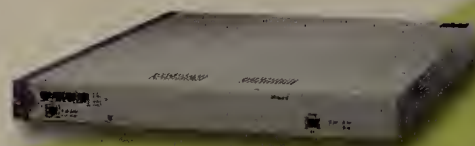
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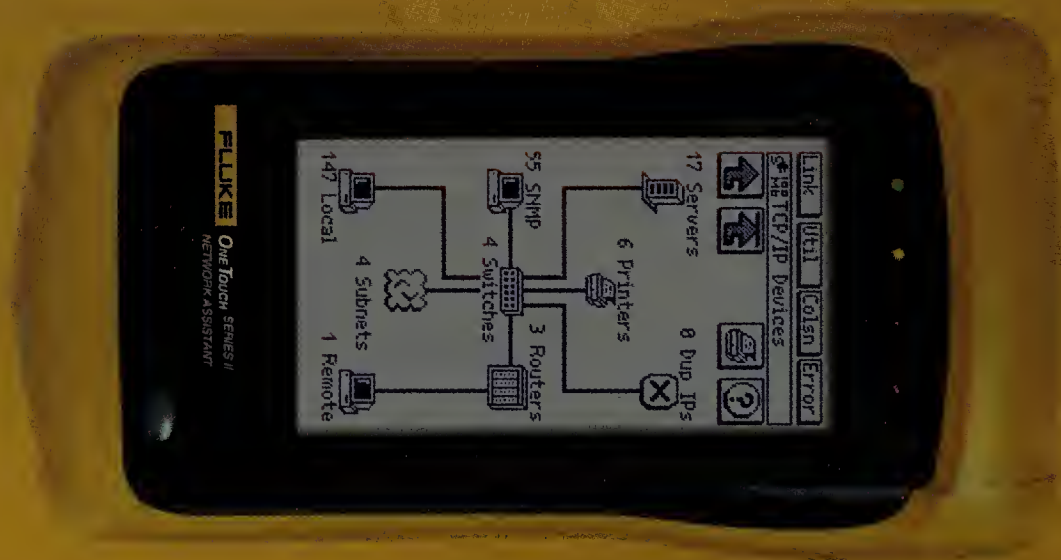


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## Briefs

**IntraNet Solutions** of Eden Prairie, Minn., has upgraded its Xpedio content server with new personalization features and support for the Wireless Markup Language (WML) format used on wireless phones. Xpedio 4.0 converts most major document types into Web-readable formats such as XML, HTML, Portable Definition Format and WML, letting corporations distribute content more easily. Version 4.0 includes user-definable pages that let each person tailor the information he or she wants to see. Prices range from \$40,000 to \$180,000.

IntraNet Solutions: [www.intranetsolutions.com](http://www.intranetsolutions.com)

**The Defense Logistics Agency** has picked Andersen Consulting to be the systems integrator for its \$390 million information-technology modernization program. Key technologies being used include SAP's enterprise resource planning software and Manugistics' advance planning and scheduling software. The agency plans to start the project in September and says it could take five years to complete. The new software will replace home-grown applications.

**Microsoft** last week released the first beta-test version of BizTalk Server 2000, the key e-commerce component of Microsoft's .Net Internet platform. The XML-based BizTalk focuses on the integration of applications across platforms and business-partner networks over the Internet. The key BizTalk feature is Orchestration, a graphical tool for defining business processes and modeling them into a workflow such as an approval cycle for a purchase order. The server is scheduled to ship by the end of the year. Pricing has not been set.

Microsoft: [www.microsoft.com/biztalkserver/takeact/beta.asp](http://www.microsoft.com/biztalkserver/takeact/beta.asp)

IN-SITE: Lessons from Leading Users

## World Bank leans on Web for collaboration

BY JOHN FONTANA

**W**hen an organization coordinates activities in 180 countries in an effort to foster economic growth and reduce world poverty, it learns a thing or two about the importance of collaboration.

The World Bank is just that organization, and during the past 56 years it has perfected its craft. The Bank is eyeing the Internet as a tool for gathering the best minds in the corporate world to help stimulate its nonprofit work.

This month, the Bank will launch a portal designed to capture and publish the intellectual capital the Bank generates through its Staff Exchange Program. To speed the project's deployment, the Bank is handing over the hosting of the portal's infrastructure and applications to a third party.

The Staff Exchange Program began four years ago as an effort to attract people from the private sector to two-year assignments to work for the Bank. The Bank also sends its employees to the participating corporations for immersion training.

"The goal is to get private sector thinking into the Bank," says Pauline Ramprasad, manager of the program. "You get a transfer of skills and a challenge to the way you think." The transfer of knowledge helps the Bank and its five member institutions better solve development and poverty problems worldwide.



World Bank's Ramprasad is using a Web portal to capture and publish intellectual capital.

Until now, however, the Bank has had no way to capture and catalog the ideas generated within the program, which has 100 corporate members. Now the intent is to create an ever-evolving Web-based library of documents that can be used as a reference tool by program participants and educate the public about the Bank.

For the foundation of the project, the Bank is using Microsoft's Exchange 2000, which has yet to ship, and outsourcing the portal, called My Staff Exchange Program, to service provider Data Return. The Bank spent eight weeks getting the portal developed and deployed, including working with

systems integrator Xepedior.

To get the portal into operation, the Bank contracted with Data Return. The hosting service in Dallas runs an early-release code of Exchange 2000, which is touted as a platform for building collaborative applications.

"The Web storage system is key for Staff Exchange in that it allows file storage and full text search," says Mark Warren, a vice president at Data Return. Another key is that Exchange 2000's Web Store can be accessed using HTTP, meaning users can get to documents using only a Web browser. Also important are index and search features that let the Bank maintain its internal rules for cataloging documents by subject such as "Transport" or "Water."

Ramprasad says it's too early to rate the hosted infrastructure but that her judgment will be based on reliability and responsiveness.

"They are the same issues as if it were our own IT staff," she says. The World Bank, which has more than 200 IT staff, plans to bring the portal in-house once Exchange 2000 ships in early fall.

In building the portal it was key to keep in mind future growth, Ramprasad says. She picked Exchange 2000 over Lotus' Raven collaboration server because she felt Exchange was more flexible and would be less expensive to customize in the long run.

The portal will let users create documents, exchange data and post information for public review. Each program member gets a personal site on the portal where that person can store documents in public or private folders to control access.

One goal is to add discussion, chats and instant messaging, all supported by Exchange.

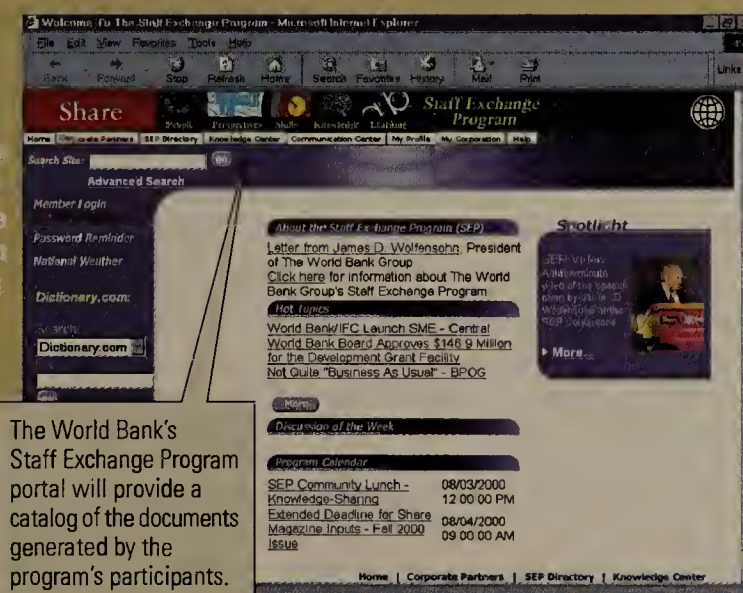
Ramprasad would not discuss project costs, but she says the important issue is that program participants were blown away by the prototype.

"People's eyes popped out when they saw they could interact with the Bank in such a way," she says.

"We have a global community and we are moving that physical community into a virtual one," Ramprasad says. ■

## Virtual World Bank

The World Bank is moving its 4-year old Staff Exchange Program online in hopes of creating a library of data produced by the program and creating a virtual community.





# Dive into your LAN without getting soaked

*Intellimax Systems' LanExplorer 3.6 software protocol analyzer gives you a deeper look at your network.*

BY BOB CURRIER,  
NETWORK WORLD  
TEST ALLIANCE

Trying to get a view inside your network is like looking at a coral reef through a glass-bottom boat. You'll catch glimpses of fish and coral, but to really see what's going on below the surface, you'll need to don a mask, snorkel and fins, and jump in. The choice you make is determined in large part by how detailed a view you want.

Choosing a protocol analyzer involves the same decision-making process. If you're looking for an easy-to-use, inexpensive product, you'll likely be happy with a software analyzer — the equivalent of the glass-bottom boat. If you need an extensive view into the depths of your network, a hardware-based solution — mask, snorkel and fins — might be more appropriate.

Intellimax Systems' latest release of LanExplorer, Version 3.6, provides network managers with an easy-to-use, software-based protocol analyzer. LanExplorer performs well on a modest laptop, has excellent reports and alerts, and includes a remote operation option. If you're looking for an inexpensive network analysis package, there's no need to gear up and swim with the sharks. Climb aboard the LanExplorer boat. We think you'll enjoy the view.

LanExplorer 3.6, which was released last month, runs under Windows 95, 98 and NT. The hardware requirements are modest; we successfully ran the analyzer on a Toshiba Satellite 1625 laptop with an AMD-K6 processor and 128M bytes of RAM. LanExplorer supports most network interface cards, but this isn't an area where you should try to save money. Software analyzers depend heavily on the performance of network cards, so invest in a good one.

Protocol analyzers are a lot like the emergency air tanks scuba divers carry. You don't usually need them, but when you do, you really need them.

Workaday network testing applications such as ping, trace-route and nslookup generally suffice for the majority of trouble-shooting.

However, when you're faced with a really nasty problem that doesn't want to reveal itself — for example, a TCP/IP window sizing error — a protocol analyzer's ability to capture packets and display their contents can mean the difference between solving the problem and scratching your head.

When you start LanExplorer, you're presented with the main console window, a neatly laid-out collection of icons and tabs. The display verges on being cluttered, but Intellimax has done a good

we could fire up Microsoft's Internet Explorer by clicking on the link. This feature was a great timesaver because it kept us from having to manually enter complicated URLs.

We deployed LanExplorer on several campus network segments. We also monitored several remote sites that were connected to the backbone by asymmetric DSL or cable modem.

LanExplorer performed well at each location but began dropping packets when presented with a high volume of backbone traffic. Because this isn't a hardware-based solution, with specialized hardware dedicated to processing traffic, you shouldn't expect 100% packet capture

bottom and a hex decode of the payload in the upper half. The decoded information was easy to understand and well laid out.

A new feature we were particularly impressed with was support for voice over IP and video over IP. We used LanExplorer to monitor a Net-Meeting videoconference between our test lab and a site in California. LanExplorer was able to detect and decode the H.323, T.120 and H.245 call signaling and set-up streams, and correctly identified the packets as having their type of service bits set to Flash override.

Cisco's Call Manager 3.0 and voice-over-IP phones didn't pose any problems for LanExplorer. We made several voice-over-IP phone calls, and Version 3.6 was on top of things, detecting and decoding the communications between the handset and call manager, and the transition to UDP packets when the connection was established.

With the convergence of voice, video and data rapidly becoming a hot topic, the ability of LanExplorer to capture and decode the new protocols is an extremely useful and important feature.

While we were capturing data, the Alarm function notified us of several events that were occurring on the network segment under examination. LanExplorer detected duplicate IP addresses and flagged them for us, and pointed out that a large number of plain-text Post Office Protocol 3 passwords were flowing across the wire.

While the majority of LanExplorer's tables and displays were nicely formatted, the charts tended to get crowded and unreadable when displaying a large number of hosts or protocols. We would have liked the ability to limit the number of displayed items on each chart.

LanExplorer offers network managers the ability to set up remote agents — distributed monitoring systems that can be operated across the network. This feature was handy,

and we used it extensively in our testing process.

We installed a Remote Agent system on our campus backbone and directed traffic to it by utilizing the mirror port feature of our Cisco Catalyst 6509. LanExplorer performed well when operated remotely and suffered from only minor slowdowns.

The console lagged slightly when compared with non-remote operation, but it was quite usable. One feature we didn't like: Out of the box, LanExplorer comes configured to automatically disconnect the current user when another remote session is established. It was disconcerting to have our capture session get blown away when another technician connected to the box. Once we adjusted the settings — an easy menu selection — to notify users that the remote probe was already in use, our sessions went swimmingly.

If you need an inexpensive protocol analyzer and don't need all the bells and whistles (or heavy-duty price tags) of the hardware-based solutions, LanExplorer is a useful product at a fair price. Install it on a laptop and you've got a protocol analyzer that will handle most situations you run across, and it won't break your back or your budget.

*Currier is director of data communications at Duke University in Durham, N.C. He can be reached at robert.currier@duke.edu.*



## NetResults

### LanExplorer 3.6

**RATING: 8.8** **COMPANY:** Intellimax Systems (now owned by Sunrise Telecom), (408) 588-9800, [www.intellimax.com](http://www.intellimax.com). **COST:** \$599 per workstation. **PROS:** Easy installation; performs well on a variety of monitoring platforms; alarm feature provides easy identification of common problems. **CONS:** No warning disconnect when another user connects to remote agent; charts can suffer from information overload.

	Installation 20%	Protocol analysis 50%	Performance 10%	Remote agent 10%	Reports and charts 10%	Total score
LanExplorer 3.6	9	9	9	8	8	8.8

Individual category scores are based on a scale of 1 to 10. Percentages are the weight given each category in determining the total score.

job of making use of every available bit of screen real estate. Most of the features you'll want to use are only one click away.

The left side of the console contains the Traffic, Statistics and Alarm panels. The Traffic panel provides tables and charts for Hosts, Matrix (host-to-host traffic) and TCP/User Datagram Protocol (UDP) port statistics. We spent most of our time using the Hosts table and were pleased with the ability of LanExplorer to hyperlink Web sites it detected. If we noticed a surge in traffic from a host we were interested in,

under high-load conditions.

The traffic-capturing facilities of LanExplorer are easy to use and nicely integrated with the rest of the program. The capture buffer defaults to 256K bytes but is adjustable up to the limit of available memory. Captures can be manually stopped or allowed to run until the buffer is full.

Once you've captured the data, LanExplorer makes drilling into the details a snap. The decode window presents a clear view of the decoded packet with Open Systems Interconnection header layer information displayed in the

Currier is also a member of the Network World Test Alliance, a cooperative of the premier reviewers in the network industry, each bringing to bear years of practical experience on every review. For more Test Alliance information, including what it takes to become a member, go to [www.nwfusion.com/alliance](http://www.nwfusion.com/alliance).







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**FOUNDRY**  
NETWORKS





'Net Insider . Scott Bradner

## APPLYING IGNORANCE TO THE PROBLEM

It is quite amazing to watch people who have just heard of some long-time technical issue assert that they have divined the true answer that has

eluded everyone else.

Their solution always seems to be marvelously simple.

They also seem to be attracted to

forums that will maximize the audience that can properly evaluate their technical competence — such as the Internet Engineering Task Force (IETF) mailing

list. In the Internet arena, a frequent target of these instant experts is IP routing; these people cannot imagine that it can be as hard as the router vendors and routing people at ISPs say it is.

IP routing sounds simple. Each router maintains a list of addresses, known as a routing table. Each address represents a network or an aggregation of networks. Associated with each entry is the address of the next router in the path toward the listed network. Whenever a router receives a packet on an incoming link it compares the destination IP address in the received packet with the entries in the routing table to find the best match. The router then forwards the packet to the next router in the path.

If that's all that there was to IP routing, then it would be easy. Well it would be conceptually easy; there would still be the question of making this work at the speeds that Internet backbones run and have enough fast memory to store the routing table. But that's not all that is involved by a long shot.

The content of the routing table changes all the time. Every time there are connectivity changes anywhere in the Internet, it may cause changes in the routing tables in your ISP's routers. Routers have to continually exchange routing information among themselves to keep the tables up-to-date. The routing tables are also derived from the input routing information, and that can take quite a bit of processing. The hot spots are the size of the table, the amount of information exchange needed to keep it current, and the time needed to process the information.

The tables in the routers in the backbone ISPs have almost 90,000 entries and are growing rapidly (see [www.telstra.net/ops/bgptable.html](http://www.telstra.net/ops/bgptable.html) for a real-time snapshot). One way to minimize the rate of growth is to ensure that as many networks as possible can be aggregated under each routing table entry. This requires customers to renumber their networks when they change ISPs so the addresses of their networks can be aggregated with those of the new ISP.

Some of the newly hatched experts in Internet routing claim this renumbering should not be needed because it should be easy to build a big enough, fast enough router to deal with much bigger tables. I assure you, if it were easy, Cisco and Juniper would have a lot more competition.

It's fun, though somewhat sad, to watch cluelessness in action.

Disclaimer: Harvard prefilters against cluelessness, unlike the IETF list. But the above is my amazement.

Bradner is a consultant with Harvard University's University Information Systems. He can be reached at [sob@sobco.com](mailto:sob@sobco.com).

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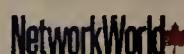
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# Call centers feeling Web's impact

BY ELLEN MESSMER

**T**raditional call centers, staffed by customer service representatives taking in-bound toll-free calls, are starting to add Web-based means for interacting with the public.

These customer service agents now engage in e-mail, online chat and Web collaboration — in which an agent takes control of a customer's browser to guide the person to specific Web pages — in addition to traditional phone communications.

However, there's the practical need to keep the number of these interactive Web sessions to a manageable level. For that reason, businesses in greater numbers also have begun using customer relationship management (CRM) software called Web FAQs (Frequently Asked Questions), which let customers help themselves.

Self-service FAQ software lets a corporation post a searchable list of answers to the most commonly asked questions about products. That way, customers can read information on the Web before turning to e-mail or interactive chat for help. Web FAQ software typically tracks how many visitors use it.

## Putting Web FAQs to use

Polaroid, for example, is using RightNow Technologies' CRM software for Web FAQs and customer e-mail management.

Polaroid's manager of worldwide service communications, Yale Cohen, says Web FAQs are an effective way to keep e-mail volume under control even as the number of visitors to Polaroid.com rises.

If a visitor finds that the Web FAQ is inadequate for whatever reason, that person can fill out a Web form. This form is then routed to the appropriate customer service agent, who would typically e-mail a response.

"The FAQ has cut down dramatically on the number of e-mails to our customer call centers," Cohen says. Polaroid began using the RightNow software for Web FAQs on a hosted basis last winter. Since then, customer contact reports show that customer e-mail volume has dropped by about one-third, while the number of visitors each month to Polaroid.com has roughly doubled to 50,000.

Research firms contend that Web FAQs are also the least-expensive means to answer questions. According to Forrester Research and Giga Information Group, Web self-service overall averages \$1 per customer contact, while an 800-number telephone conversation can range from \$10 to \$33, and e-mail from \$3 to \$10.

One reason for the upward spike in Polaroid Web

**CRM SOFTWARE**  
*Customer relationship management software gets a boost from by Web FAQs, chat and other tools.*

visits is that AOL last June purchased Polaroid digital cameras to sell directly online. Polaroid's call centers handle postsale questions for online and brick-and-mortar retailers.

Symantec is now looking at CRM offerings afresh, given that there are now more than three dozen companies selling some form of Web-based CRM products.

Many of the larger CRM vendors (see graphic) are adding Web components to the software suites they have sold for almost a decade to traditional call centers.

Oracle, PeopleSoft (which bought Vantive) and Clarify (purchased by Nortel Networks late last year) are among the big CRM players whose latest call center software suites include Web components.

On close inspection, all have distinct differences. For instance, the Oracle 11i software suite — which requires a corporation to use the Oracle 8i database — includes Web FAQ and e-mail management, but no Web collaboration. That missing component is

expected to be added as an upgrade next year when Oracle integrates Cisco software for Web collaboration into its offering (Cisco's Customer Contact Software was obtained via Cisco's purchase of WebLine Communications).

Although Nortel and Cisco are bitter rivals competing in vast network equipment markets, Cisco uses Nortel's Clarify software for traditional call center management, and Web-based FAQ, e-mail and chat at the Cisco Technical Assistance Center.

"I'm not happy about using our competitor's product and giving them money," admits Steve Gordon, the Cisco Technical Assistance Center director.

However, Cisco began using software from Clarify years before Nortel purchased the company. Cisco organized its call center, manned by 1,000

engineers, to provide phone- and Web-based assistance on difficult technical questions to thousands of enterprise customers, ISPs and telephone companies.

The engineers use the WebLine collaborative Web browsing software to guide customers to specific Web FAQ content, letting them review it, then continue the dialog by phone if questions remain.

Several CRM software vendors, among them Cisco, WebDialogs and FaceTime Communications, believe voice over IP can be used for direct voice communications over the Web between customers and customer contact centers.

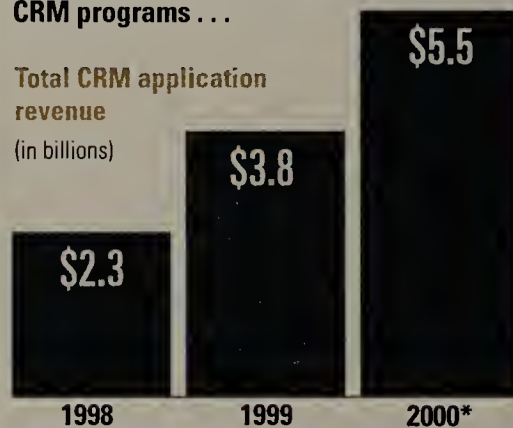
Although a lot of effort is being put into developing voice-over-IP CRM products and hosted services, many corporations say they just aren't that interested.

"We just don't think it's sophisticated enough yet," says Jean Ballweg, supervisor at the Internet contact center at retailer Lands' End, which uses Cisco's Web CRM collaboration software. ■

## CRM explosion

The market for customer relationship management (CRM) software has boomed as traditional call centers add Web-based CRM programs . . .

Total CRM application revenue (in billions)



SOURCE: AMR RESEARCH, BOSTON

. . . and suppliers such as Siebel Systems are reaping the rewards.

The top five leaders in CRM application revenue (in millions)

Company	1999	2000*
Siebel	\$790	\$1,255
Clarify	\$230	\$396
Oracle	\$206	\$355
PeopleSoft	\$205	\$287
Baan	\$137	\$191

\* Estimated

"We can tell retailers 'We have a dynamic help site so you won't have to provide the call center to answer customer questions,'" Cohen points out. "It's a valuable asset for us." So valuable that Polaroid plans to Web-enable its call centers across Europe for multilingual support.

With these kinds of changes, it's no wonder the traditional call center is now being referred to as the "customer contact center."

However, Web-based CRM is still so new that many corporations, including Symantec, have written their own software rather than bought an off-the-shelf package.

Michael Fischer, Symantec's supervisor of online sales, says the company chose to write its own Web FAQ, e-mail management and chat software because the software available a few years ago wasn't that impressive. "We looked at Siebel and other companies at the time and decided to roll our own," Fischer says.



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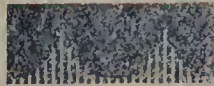
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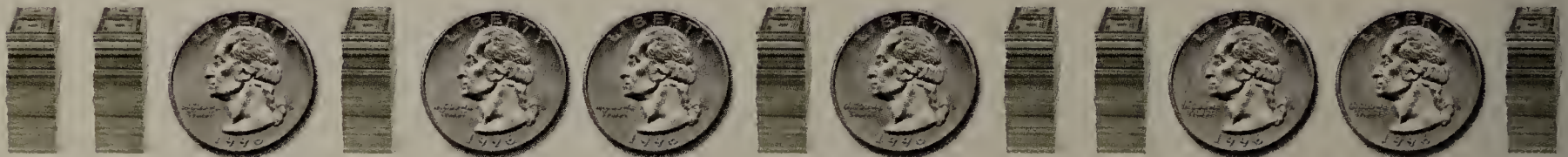




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## Ask Dr. Intranet

By Steve  
Blass

Our intranet uses Netscape's Enterprise Server and Netscape Navigator. We also use an IBM AS/400 to serve dynamic

pages using NetData. Most of the dynamic pages are fed from the AS/400, while a Novell 4.11 file server running Netscape's Enterprise Server delivers static pages. When we need to change a static page, we use an HTML editor to change the content. Ideally, we would only have to change text documents. We'd like to have the text for these pages changed by someone who doesn't have HTML coding knowledge. The HTML editor we use is a shareware copy of CuteHTML. Should we buy more sophisticated software, or is this something that can be accomplished via Java? Our goal is to have the IS department provide the intranet's structure but to have individual departments responsible for their own content.

If your word processor supports it (Word 2000 does), have the departments use the "Save as HTML" feature, which might let you place your text file on the Novell server, where your Web server can pick it up and deliver it to the browser clients. If you establish FTP services on your Web server, you can use the "Edit Page" and "Publish" features built into Netscape browsers to maintain your departmental intranet pages as if they were text files instead of HTML documents.

Blass is a network architect at Sprint Enterprise Network Services in Houston. He can be reached at [dr.intranet@paranet.com](mailto:dr.intranet@paranet.com).

# Technology Update

An Inside Look at the Technologies  
and Standards Shaping Your Network

## Intelligence at the network edge

BY KEITH HIGGINS

As the DSL subscriber base grows, service providers face rising expectations from their customers, who increasingly regard high-speed Internet access as a commodity. To compete successfully, DSL service providers must differentiate themselves by offering a range of value-added services, including multiline, toll-quality voice service; VPNs; frame relay; videostreaming; and emerging productivity and entertainment applications.

High-performance, IP-based technologies are spreading in metropolitan-area networks and WANs. Enabling dynamically

IP packets into fixed-size, 53-byte cells. Because all cells look the same to them, ATM-based DSLAMs cannot discriminate between different kinds of IP traffic. A DSL service provider using ATM-based DSLAMs must, therefore, provision separate permanent virtual circuits (PVC) for each kind of traffic and for each subscriber. Take, for example, a DSL service provider that signs up 100 subscribers for a range of services, including high-speed Internet access, and services requiring guaranteed quality of service (QoS) such as voice and VPNs. Because an ATM-based DSLAM cannot tell the difference between Internet, voice or VPN packets, a provider relying on this tech-

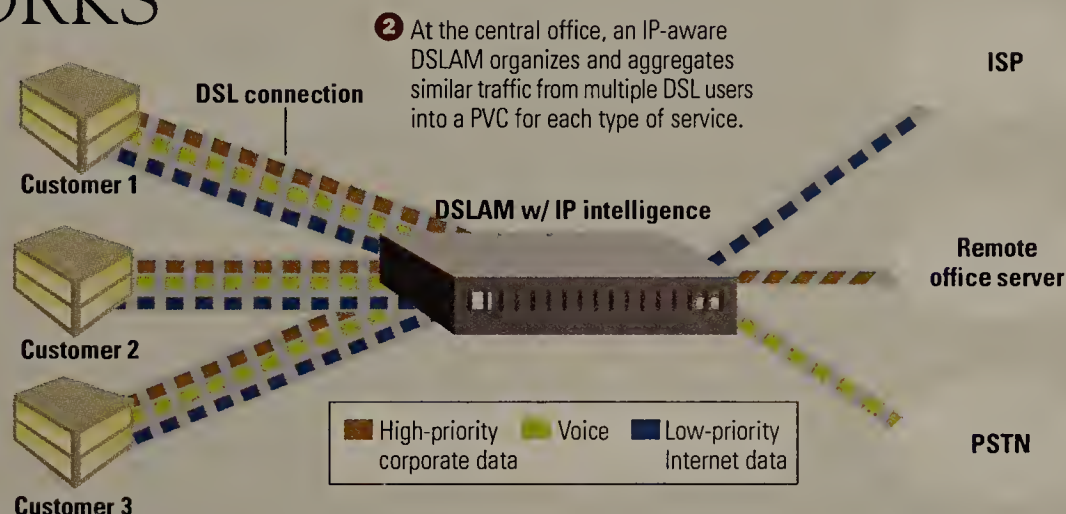
For instance, a DSL service provider using a DSLAM or concentrator with IP intelligence can provision the same services as in the ATM example above, for the same 100 subscribers, with just three egress network paths. Concentrators with IP service intelligence can make intelligent traffic forwarding and queuing decisions in the access network based on any combination of header information at Layers 2, 3, 4 and 7. They can also prioritize traffic based on IP header information, and keep traffic from different services compartmentalized and secure. Working with voice gateways, for example, concentrators with IP service intelligence can aggre-

## HOW IT WORKS

### DSL Access Multiplexer

A DSL Access Multiplexer (DSLAM) with IP intelligence can differentiate one kind of IP packet from another, enabling a broad range of dynamic service provisioning.

- Each customer generates various types of traffic on a single DSL line. Each DSL connection can carry multiple traffic types. In this example, each customer has voice traffic, high-priority corporate data over a VPN and low-priority Internet data.



- The number of virtual circuits is drastically reduced, improving the scalability and speed provisioning of traffic.

scalable speeds from 1M bit/sec to 1 terabit/sec, these new IP transport media can move voice and data at a fraction of the cost of circuit-based ATM and SONET technologies.

IP service intelligence can help DSL providers satisfy an exponentially expanding, increasingly demanding customer base on one hand and take advantage of an evolving network core on the other. This IP technology is integrated into the DSL Access Multiplexers (DSLAM), or concentrators, that reside at a network's edge, and aggregate and forward subscribers' upstream traffic, and separate and deliver their downstream traffic. IP service intelligence will let DSL providers economically provision, scale and manage a range of services in today's ATM core environment and migrate easily to the end-to-end IP environment of the future.

ATM-optimized DSLAMs must break

nology must set up 100 separate PVCs for Internet access, 100 PVCs for VPN service and another 100 PVCs for voice service — one PVC for each service, for each subscriber, or 300 in all. Moreover, a human operator must access the management system of each network component and manually set up and test each virtual circuit for every subscriber.

Unlike ATM, concentrators equipped with IP service intelligence can differentiate one kind of IP packet from another, enabling a range of dynamic service provisioning. They can tell the difference, for example, between voice, VPN and Internet packets, and securely sort similar packets into appropriately tailored network paths. The ability to aggregate diverse traffic from multiple subscribers onto shared paths yields significant advantages over ATM-optimized technologies in provisioning and scaling DSL networks.

gate all voice subscribers into one low-delay path through the transport network. They can work with ISP routers to aggregate traffic for Internet subscribers. For corporate VPN subscribers, they can aggregate any number of connected employees into one VPN tunnel.

In today's network environment, in which ATM functions as the QoS enforcement mechanism for voice traffic, concentrators equipped with IP service intelligence represent the most cost-efficient method for DSL service providers seeking to provision a growing array of services for an expanding subscriber base. In the coming all-IP networks, IP service intelligence will become essential.

Higgins is assistant vice president of product marketing at Copper Mountain Networks in Palo Alto. He can be reached at [khiggins@www.coppermountain.com](mailto:khiggins@www.coppermountain.com).



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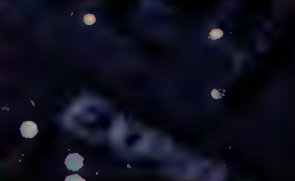
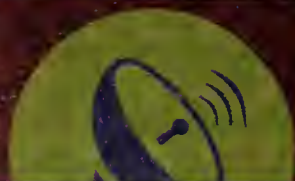
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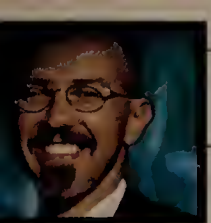
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Gearhead — inside the network machine . Mark Gibbs

## FOLLOW-UPS AND A QUESTION

Last week Gearhead wrote about the Linksys Etherfast Cable/DSL Router and received two pieces of mail. The first was from Linksys which tells me that the one- and four-port devices are the “first routers to outsell Cisco’s [low-end router products],” . . . sounds like a significant market niche.

On the flip side, Loren Willis wrote in to tell us: “While [the Linksys router] is as capable as you say, it is not without its problems. It would not give out [Dynamic Host Configuration Protocol] addresses to either an Intel 10/100 [network interface card] or even a Linksys 10/100 NIC in my home network. It has some problems with a pretty extensive list of NICs. Check out [www.timhiggins.com](http://www.timhiggins.com) for a complete list. Maybe it should only have gotten a nine out of 10.”

Hmm. Gearhead has both types of NICs in use and so far no problems, although according to Loren, “Version 2 of the Linksys NIC works, but I have Version 4 and it did not.”

The [www.timhiggins.com](http://www.timhiggins.com) site notes the router is a “popular, fast router, but with nagging data corruption problems for some users.” On the site’s bulletin board, the ratio of positive comments to negative is running at around 4-to-1 with a lot of complaints about Linksys support. Gearhead will let you know if Linksys has anything to say about this.

Further back in time, Gearhead wrote about the Rebol language ([www.nwfusion.com](http://www.nwfusion.com), DocFinder: 9532). Rebol is an elegant, cross-platform scripting language that boasts versions for 41 platforms as well as 90 experimental versions including one for BeOS and Windows CE. Alas, still no NetWare version.

Gearhead recently received a copy of the first book on Rebol, *Rebol: The Official Guide*, a hefty 752-page tome by Elan Goldman and John Blanton. This is a really interesting book and does a soup-to-nuts job of explaining the Rebol language. It also manages to elucidate some of the more complex concepts including something called “dialecting” that lets you create application-oriented languages (that is, languages under Rebol that are specific to a context such as handling a database designed for a video store).

While we are on things algorithmic, someone foolishly asked Gearhead the other day “What is a regular expression?” While there are many humorous answers to this question the truth is regular expressions are used to specify string-matching specifications.

If you have ever wrestled with vi or Emacs or fooled with egrep you might have bumped into regular expressions as you might if you have ever programmed in Perl, Python or Tcl.

Regular expressions are so much a part of computer languages and tools because they are very powerful and easily implemented.

When you learn to use regular expressions, you’ll find yourself tossing out constructs (under Unix) such as egrep ‘[Qq][^u]’ words.list to find all words that start with upper or lower case “q” followed by anything that isn’t a “u.” Thus, the regular expression will find Qantas, Iraqi and Iraq.

The example used above was borrowed from the book, *Mastering Regular Expressions*, by Jeffrey Friedl.

Now it’s up to you: Do you want more on regular expressions? If so, string Gearhead along at [gh@gibbs.com](mailto:gh@gibbs.com).



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## Editorial

### Getting more familiar with the Tellme portal

I was less than enthused about the new Tellme voice portal when it was in the test phase, but now that the service is officially open for business, it's growing on me.

If you haven't tried it, give it a go by dialing (800) 555-Tell. It's a free service driven by speech recognition that lets you retrieve information about airlines, movies, restaurants, sports, stocks, traffic, weather and even taxi companies.

One of the cool things is it figures out where you are based on the telephone exchange you're dialing through. When I said "restaurants," it came back, "Let's look for restaurants in Marlboro, Mass. If you want a different location, say a city and state now."

It's pretty sophisticated. For example, it lets you search for restaurants by cuisine. I picked Mexican. It came back with nine local options. The one at the top of the list was the Iguana Cantina, and Tellme gave me the address and told me I could listen to a Zagat review, which I did. The review said a little about the place and gave it a 16 out of 30 for food. Dinner cost about \$19.

Tellme then gave the address again and the option to "connect." I tried it and, sure enough, Tellme rang me through to the Iguana. Very cool.

Then I decided to see just how powerful the voice recognition technology was. So I backed up, and when Tellme asked me for the name of the restaurant I was interested in, I said Iguana Cantina. Tellme came back with "Linguina's Italian Eatery is located at..." I tried the Iguana again. Tellme said: "Clockwork Pizza is located at..." Again: "B&G Eatery is..."

OK. There are a few bugs to work out.

The system interjects ads, such as "Brought to you by AT&T," but you can blow by them if you know the key navigation words. Say stock, for example, and you are taken there (you get 20 minute delayed quotes and even news snippets).

The taxi option is very useful because it automatically connects you to a local company. Traffic updates are somewhat useful, again because the system knows where you are, but you can't zoom in on a particular route. Weather updates only go one day out.

All in all, Tellme is an interesting new service worth checking out.

— John Dix  
Editor in chief  
jdix@nwfw.com

Message Queue

### THE NOVELL BLACK HOLE

Regarding Mark Gibbs' "Backspin" column "Overhauling the Novell black hole" (www.nwfw.com, DocFinder: 9522):

Don't be surprised if Citrix buys Novell — it is looking for a network operating system to call its own.

Citrix's relationship with Microsoft seems genetic, with Microsoft owning 30% of the company, but looks can be deceiving. Microsoft had intended to buy Citrix in a hostile takeover but was shut out at 30% by Citrix's management. Since then, this firebrand company seems to enjoy tweaking Bill Gates' nose at every turn. There is no love lost here.

Citrix is the only company I have ever heard of that has source code access and a license to the Windows NT kernel. This is one of Gates' biggest blunders. Citrix can graft the NT kernel bits onto any network operating system.

Citrix can use the NT kernel to run Win32 apps and thus can support the installed base of Win32 apps on any platform natively. To my knowledge, no other company can do this. Citrix has the NT version, Unix version, probably a Linux version in the works and with the theoretical purchase of Novell... Get the picture?

Robert Webb  
Palm Desert, Calif.

Much to my sorrow, Novell will go the way of Banyan VINES — and there is absolutely nothing the wizards in Utah can do about it.

I've had numerous job interviews with companies that are interested in my Novell experience to help them migrate from NetWare to Windows NT, Solaris and Linux. These companies aren't ripping out tens or hundreds of NetWare servers; they're getting rid of ones and twos. For Novell, this is death by a thousand cuts. Almost no one will dispute NetWare's abilities as a file and print server, yet I know of at least two midsize companies that are replacing NetWare 3.12/4.11 file and print servers with NT — mostly to get rid of IPX on the LAN/WAN. Neither has given NetWare 5.x a second look. Whose fault is that?

E-mail letters to [jdix@nwfw.com](mailto:jdix@nwfw.com) or mail them to John Dix, editor in chief, Network World, 118 Turnpike Road, Southborough, MA 01772. Please include phone number and address for verification.

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## MORE ONLINE

Find out what readers are saying about these and other topics.

DocFinder 9122 online

I just spent \$250 on texts, practice tests and a certification exam to upgrade from CNE 4.x to CNE 5.x. This is the last time. There's no economic benefit or incentive for me to spend one more dime on any Novell product. They've lost the small and midsize businesses that make up the bulk of employers here, thus most don't give a damn whether I've got a CNE or not. My minimal AS/400 training and experience is a much more valuable asset, as is my five years with Linux.

Bill Sneed  
Prospect, Maine

I built my global network on Novell technology. Why? Because Windows NT and Windows 2000 couldn't do the job.

We consider Novell a strategic partner. Am I worried? Some days, especially when I see other large Novell shops abandon Novell technology while admitting they will now have to compromise features and hire larger staffs.

We have become an industry absorbed with marketing and futures, not solving business problems with real technology. If companies made their technology decisions based on technology rather than marketing, Novell would be in better shape.

Chip DiComo  
Global network manager  
Hellmann Worldwide Logistics  
Miami

Novell has the technology — it always has. What it's suffering from is IBM-potence: not being able to market anything to anybody. As a result, the current customer suffers.

I've been pushing Novell for information on Macintosh connectivity. It's been five months since Novell announced the IP-based NetWare Loadable Module for Mac clients.

There should be a beta test — or at least an alpha test — version of the software we can try. To the customer, no communication on a product means that product is an undeliverable. If Novell fails here, they've lost our business. Unfortunately, it looks like Microsoft will probably get that business.

Mike Maday  
Chicago

This has been a test of the INTERNET EMERGENCY PREPAREDNESS SCHEME...

If this had been a REAL EMERGENCY...

You'd dismiss it as another Internet rumor...

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## WI-FI CERTIFICATION HELPS WIRELESS LANs COME OF AGE

The wireless LAN market has come a long way in recent years and is poised for even greater growth. A study, "Wireless LANs: Market Demand and Opportunity Assessment," released in May by The Phillips Group's Infotech Division, predicts the market will reach \$1.7 billion by 2004, an increase over posted revenue of \$300 million in 1999.

To really understand why the industry is starting to grow so rapidly, it is crucial to grasp the importance of interoperability between vendors' products across the enterprise, home and frequently traveled areas such as airports and hotels.

For wireless LANs to become a viable extension of, or alternative to, their wired counterparts, two things were required: the ability to support a data rate of 10M bit/sec or higher and true out-of-the-box interoperability. The IEEE 802.11b high rate standard, approved last fall, let wireless networks support data rates of up to 11M bit/sec, but interoperability challenges persisted because of variables and subtleties associated with radio-based products compared to wired ones.

It became clear interoperability needed to be as simple as opening the boxes of two vendors' products, plugging them in to a laptop or PC and *voila* — they'd work. That is precisely why the Wireless Ethernet Compatibility Alliance (WECA) was formed: to certify interoperability of different vendors' products. Products that pass WECA's rigorous two-day battery of tests, performed by Silicon Valley Networking Laboratories, receive the right to bear the Wireless Fidelity (Wi-Fi) logo of interoperability.

Industry acceptance has been dramatic. Currently, more than 50 leading technology firms from around the world have joined WECA since July 1999. Results have been equally impressive, with more than 30 products from 15 vendors receiving Wi-Fi certification since April.

Meanwhile, wireless LAN hardware prices have decreased. One factor that helped bring this about was Apple's decision to include Wi-Fi-based wireless LANs in its iBooks and iMacs at an unprecedented price of \$99. This move has forced the PC makers to include such an option in their products.

The next step is for the wireless LAN industry to resolve some security issues that are currently hindering additional interoperability; specifically, the need for security standards. Once that happens, the sky's the limit, especially in the enterprise market.

Beyond that, the only thing users can expect in the future is speed, which could reach 22M bit/sec in the 2.4-GHz band in the near future.

These greater speeds, coupled with solutions to the security issues, will boost sales and help the industry reach into two key horizontal markets: enterprise and consumer. Once these markets open up, costs should come down, making wireless LANs as common as the cordless phone. The foundation is in place; it's only a matter of time before the building is completed.

*Belanger is chairman of the Wireless Ethernet Compatibility Alliance, a nonprofit organization formed in 1999 to certify interoperability of Wi-Fi products and to promote Wi-Fi as the global wireless LAN standard across all market segments. He can be reached at phil@wayport.net.*

## Reality Check . Thomas Nolle

## THE SHAPE OF MULTIMEDIA TO COME

The good news is we may be on the verge of seeing multimedia services at last. The bad news is these services may not develop the way many thought they would, forcing us to reconsider the Internet's role in entertainment.

Enron, SBC Communications, Verizon, Qwest Communications and Covad Communications are combining to work with Blockbuster for content and Telus and ReFlex for security to create a video delivery network that's supposed to offer us DSL-based pay-per-view movies. The service is expected to be available later this year and provide customers with



"VHS-like" quality — which in the industry has traditionally meant you'll know you aren't watching TV. Details of the deal aren't yet available, but some interesting rumors and factoids bear examination.

The buzz is the new service will involve a set-top box with a hard drive or delivery to a video-capable PC. The concept would work something like the way so-called instant-replay video recorders work. Incoming video material would be stored on the drive to be played later.

This would let the content be staged to the customer location at whatever speed the combination of the delivery network and access network would support. It would also let providers take advantage of multicasting to deliver material to a number of households that want to watch the movie at a

later time, whereas instant on-demand viewing essentially would require that the subscribers be fed video individually.

Why not have real video-on-demand? Because the economics won't wash.

Everyone who uses DSL or cable modems knows that high-speed connections are really shared by a number of customers. Even compressed video, to have VHS-level quality, probably needs about 1.5M bit/sec of bandwidth. That equates to about 180K byte/sec of download. When's the last time you saw that kind of transfer rate on a file, DSL users? Making video-on-demand work would mean offering the consumer so much bandwidth at a low cost that companies would send their servers home with employees to get a better deal, and the ISPs would suffer a big economic hit.

This is a good idea, and it illustrates a truth about multimedia over DSL or cable modems. We need to expect less "streaming," or real-time material, and more material that's staged to local disk, or that's more interactive — like multiplayer virtual reality games. Either one lets the provider and user work around the realistic limits of bandwidth to the consumer and would be a major step forward in entertainment and a major profit source for the providers.

But moving beyond rumor, an interesting fact comes out of this announcement: The service will offer expansion to include Internet service. That means the service isn't Internet service with video over it at the start. What we may be seeing is the first example of a parallel-to-the-Internet content network that delivers material to the subscriber in

an IP format. I've said before that the future of public IP will be created by a number of parallel networks, only one of which will be the Internet of today, and it looks like we're seeing the future already.

Another interesting fact to emerge from the announcement is the selection of the access players in this deal. We have SBC, Covad and Verizon — all ATM-based DSL providers. Could it be that ATM technology is going to be central to the service-delivery process? Could all those bell heads be right in saying that IP over ATM is deterministic IP and anything else is smoke and mirrors?

The big winners in this deal are those DSL providers. SBC and Verizon are committed to a major modernization of their access network, based on fiber remotes and ATM, and likely including ATM Passive Optical Networking technology. Recently released into the DSL market by regulatory change, SBC and Verizon need to catch up, and video service certainly would help them do that, as well as rain on arch rival cable companies' parades. For Covad, the move could result in a stock boost and point out that there may be a real value in having an ATM-based DSL infrastructure.

However you slice it, this deal has potential for level-setting multimedia expectations and technology, and we'll need to watch it closely.

*Nolle is president of CIMI, a technology assessment firm in Voorhees, N.J. He can be reached at (856) 753-0004 or tnolle@cimicorp.com.*



BY APRIL JACOBS

# INSIDE

**T**here is little doubt that Intel is becoming a force to be reckoned with in the network arena. The company has moved beyond its stronghold in the desktop and server chip business and is offering everything from network building blocks to finished products in a variety of niche markets.

Still, the company faces an uphill battle in competing with established powerhouses such as Cisco and Nortel Networks, as well as start-ups that can move quickly to address users' needs.

"[Intel has] made a concerted effort to match up where everybody else is lining up, but what hasn't been made clear is how they are going to loosen the fingers of the Ciscos of the world," says William Hurley, an analyst with The Yankee Group in Boston.

Hurley says Intel has brought forth a good set of discrete products in the data center market but needs to make clear how it plans to penetrate the loyal user bases of competitors such as Cisco and Nortel.

Intel is far from worried and Scott Richardson, general manager for its Internet management and appliance division, says the company strategy is sound. He notes the products it has aimed at e-commerce are in some cases less than 1 year old. He

also notes that while Intel's NetStructure line of e-commerce and data center products is new, Intel has been in the network business since 1994.

He says the company is well-suited to compete in the Web server arena because Intel's roots have always been the desktop and the server. "If you look at the world of networking, the Ciscos own the network core, but it also has a lot of end-points. The other set of endpoints is the Web server farms. The NetStructure product family is very focused on server farms. And while there are a lot of the big switches, there are also a lot of servers — all Intel-based," Richardson says. "We play a very big role in those server farms, and in between, is a lot of network control appliances — and that is where NetStructure is focused."

To accommodate its network products and components, the company spun off three business divisions last year, including the Communications Product Group, the Network Communications Group and the Wireless Communications and Computing Group. The Network Communications Group provides the building blocks for products targeted at the company to the home consumer. This group is responsible for Intel's IX Architecture on which its network processors are based.

Observers say OEMs such as Cisco, which

announced support for the IX Architecture last September, can use it to design products more cost-effectively than with traditional Application Specific Integrated Circuit technology, which requires a new design with each product upgrade.

Intel's technology lets silicon be reprogrammed, allowing for more reuse of existing designs — similar to reusing existing software code when improving on an application. Supporters of IX also include Nortel, which plans to use Intel's IX Architecture with its own OpenIP software for network device design.

To fortify its IX Architecture, Intel went on a shopping spree that began in May 1998 with the announcement it would purchase Digital Equipment's semiconductor business. For about \$625 million, Intel bolstered its manufacturing resources and got the license for Digital's Strong-Arm chip technology to use in its forthcoming network processors.

The company then announced in March 1999 it would purchase Level One Communications for \$2.14 billion. Level One provided the silicon used in a variety of network and communications products. Add to that seven more purchases announced from July 1999 to March of this year (see graphic, below).

**1**  
**SOFTCOM MICROSYSTEMS**  
Announced: July 1999  
Price: \$149 million  
Product: Silicon components used for processing packets of information transmitted within high-speed WANs.

**2**  
**NETBOOST CORP.**  
Announced: September 1999  
Price: \$215 million  
Product: Hardware and software for deploying policy-based applications in network gear for more easily monitoring and managing network traffic.

**3**  
**STANFORD TELECOMMUNICATIONS, TCP DIVISION**  
Announced: September 1999  
Price: Not disclosed  
Technology: Brings Intel communications silicon capabilities in the cable broadband market.

**4**  
**THINKIT TECHNOLOGIES**  
Announced: February 2000  
Price: Not disclosed  
Technology: Thinkit and its Bangalore, India subsidiary Software & Silicon Systems, provide additional communication, silicon engineering and design expertise for components used in Intel's IX Architecture.

**5**  
**AMBIENT TECHNOLOGIES**  
Announced: February 2000  
Price: About \$150 million  
Product: Ambient designs chips used in modems, including a chipset that delivers DSL and high-speed analog modem functionality in a single device.

**6**  
**GIGA A/S**  
Announced: March 2000  
Price: About \$1.25 billion  
Product: GIGA in Copenhagen, Denmark specializes in the design of advanced high-speed communications chips used in optical network and communications products.

**7**  
**BASIS COMMUNICATIONS CORP.**  
Announced: March 2000  
Price: About \$450 million  
Product: Basis supplements Intel's communications silicon and software offerings with a network processor used in a range of network access systems, such as switches linking LANs to the Internet.



**to compete with enterprise network kingpins.**



Still, that list doesn't give the whole picture. Other acquisitions make up the basis for Intel's Communications Products Group's e-commerce products, which now include a range of switches and specialized devices aimed at Web acceleration. Those acquisitions include (see graphic, below):

**CASE TECHNOLOGY**

**Announced:** January 1997

**Price:** \$72 million

**Product:** Network products for Ethernet switching used by small to midsize businesses.

**OLICOM A/S (network systems development group)**

**Announced:** September 1999

**Price:** Not disclosed

**Technology:** Acquired the network systems development group of Olicom A/S.

**DAYNA COMMUNICATIONS**

**Announced:** September 1997

**Price:** Not announced

**Product:** Adapters, switches and hubs aimed at small businesses.

**IPIVOT CORP.**

**Announced:** October 1999

**Price:** About \$500 million

**Product:** E-commerce equipment aimed at securely managing Internet traffic.

**SHIVA CORP.**

**Announced:** October 1998

**Price:** \$132 million

**Product:** Software aimed at small and midsize businesses for VPNs over the Internet.

**PARITY SOFTWARE DEVELOPMENT CORP.**

**Announced:** November 1999

**Price:** Not disclosed

**Product:** Develops object-oriented software for computer telephony applications.

**XLNT NETWORKS**

**Announced:** February 1999

**Price:** Not disclosed

**Product:** High-end switches for small and midsize businesses.

**VOICE TECHNOLOGIES CORP.**

**Announced:** February 2000

**Price:** Not disclosed

**Technology:** Provides Intel and its Dialogic subsidiary with technology that lets PBX telephone switches link to the Internet.

**DIALOGIC CORP.**

**Announced:** June 1999

**Price:** \$732 million

**Technology:** Hardware and software building blocks for computer telephony.

**PICAZO COMMUNICATIONS**

**Announced:** April 2000

**Price:** Not disclosed

**Technology:** Lets Intel and its Dialogic subsidiary accelerate customer deployment of communications solutions based on CT Media server software.

Intel also fortified its Wireless Communications and Computing Group, which was formed in December 1999 with the acquisition of DSP Communications, a company that made chipsets and software for cellular phones that can be used for data and voice communications. The company also hired about 75 people from Visteon's Ford Microelectronics last June. Most of those people are analog chip design engineers enlisted to help Intel's wireless efforts.

With that technology and engineering talent in-house, Intel still has to convince users — and industry analysts — that it can compete.

"They are not even on our list of tier one, two or three vendors yet," says Peter Firstbrook, an analyst with Meta Group in Stamford, Conn. "They do have niche products, but they need to come up with viable workgroup solutions, like those that can provision 5,000 desktops."

According to Firstbrook, Intel has good campus network products, but it must also provide things such as workgroup stackable switches and backbone switches to be an enterprise player.

One factor making Intel's life more difficult is that other niche players with hot products are

being bought up by the top-tier vendors. Cisco recently purchased Web switch maker ArrowPoint Communications, and Nortel made headlines a few weeks ago by scooping up Alteon WebSystems — another front-runner in the Web-switch arena.

For end users who have Nortel and Cisco prod-

ucts installed, the choice to buy niche products such as Web acceleration devices could be made easier by going with a vendor they have an established relationship with.

"[Cisco and Nortel] have such a strong sales channels into the enterprise, that they might choose to just add those types of products to the list of what they buy because the salesperson is always in there," he says.

What is playing in Intel's favor, Firstbrook and others say, is that Intel has worked hard to diversify its business over the past few years, offering hosting services and other value-added programs for end users that entice customers to choose additional products from Intel if they are satisfied.

"I would say that even with Web site-focused organizations, they still have very little brand name recognition — they are only just beginning," says Greg Howard, an analyst with the HTRC Group in San Andreas, Calif.

He says that doesn't spell doom and gloom. Howard says if Intel can respond quickly to change and focus on performance, it will do well. "But certainly, they are facing much stiffer competition than they do in the processor arena." ■

### Intel's expanding product line

**The bulk of Intel's revenue comes from its Pentium, Xeon and Celeron chips, but the company has a broad range of network products and Internet services:**

**Networking and communications**

- Web accelerators
- Traffic management tools
- Caching appliances
- Traffic shapers
- Server platforms
- Remote access and VPNs
- Routers
- Switches (10/100/1,000)

**Internet services**

- Application hosting
- Streaming media distribution
- Authentication for online transactions
- Video and data services for Web and interactive digital TV





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# BUILDING AN ENTERPRISE SAN

**Despite interoperability  
and standards issues,  
end-to-end SANs can be  
cobbled together.**

BY DENI CONNOR

**A**

nalysts estimate that the typical brokerage operation loses almost \$6.5 million per hour if its system goes down, and an airline reservation center loses nearly \$90,000 per hour.

You might be considering a storage-area network (SAN) to reduce system downtime. Or you may need to consolidate a number of Windows NT and Unix servers to one storage source, or make more effective use of data capacity. You might need to integrate legacy storage located on mainframe computers with open system-based networks, group disparate storage devices or back up your network more efficiently.

Whatever your purpose, despite interoperability problems and a lack of standards, there are some end-to-end SAN packages to meet your needs.

You first need to make some decisions: How large does the SAN need to be? Will it need to grow? Are you looking at it as an intermediate step before converging your storage data back to IP when bandwidth-over-IP issues are resolved?

If your only desire is to perform server-less or LAN-free backup, which frees the server of extra processing and the network of additional traffic, you may want to implement a Fibre Channel Arbitrated Loop environment with a fixed-size SCSI-to-Fibre-Channel hub or router.

While this choice may be inexpensive, it could limit you if you need to add more functionality to the SAN via switched fabric and expand its size in the future. Your investment in hubs and host bus adapters that only operate in loop environments may be wasted if you can't redeploy them elsewhere.

QLogic, JNL, Agilent, Emulex and Interphase manufacture PCI and S-bus-based host bus adapters for switched-fabric and arbitrated-loop environments.

#### **Scale and availability**

If you decide to implement a switched fabric, you can install either a Fibre Channel switch or a chassis-based Fibre Channel Director-type product. The differences between these two devices are scale and availability. In terms of scale, fabric switches are typically limited to eight to 16 ports, and director-class devices can sustain bandwidth

over 16 to 128 ports. InRange, a vendor with director-class products, has announced plans to increase this amount as SANs grow in size to 256 ports in the next year.

McData and Ancor also make director-level switching products. In a configuration in which all ports have access to the full bandwidth of the network, one 64-port director is the equivalent of 12 interconnected 16-port fabric switches. A backplane in the enclosure lets switching take place.

When it comes to system availability, you can ensure redundancy by doubling up on switches and offering multiple paths for data traffic between the server and storage device while making sure the switches interoperate with other switches to implement failover. The more-expensive investment of a director-class product gives you redundant power supplies, fans and hot-replaceable components in addition to multiple paths and a larger number of ports, letting you offer the highest level of quality of service (QoS).

You can get up to five levels of QoS from hubs, fabric switches or director switches. Hubs are failure-sensitive and failure-resilient — they offer either no redundancy or partially redundant paths. Switches and smaller director products offer failure resiliency at two QoS levels. Only directors, which offer Level 4 and 5 QoS, are completely fault-tolerant and allow fully redundant paths, interconnects and backbone interconnects.

If you need five 9s of availability, have a high port count, require a complex SAN fabric or find that downtime is much too costly, you should consider a Fibre Channel director switch. If you are concerned about the cost of the fabric, can accept some degradation in fabric performance and are implementing a smaller SAN with fewer than 64 ports, you can get by with a fabric switch. Fibre Channel fixed-port switches offer failure resiliency but not stand-alone fault tolerance.

#### **Managing and extending your SAN**

When you choose software to manage your SAN, you should partner with a vendor that has products that give you the most flexibility and functionality possible working on as many operating system platforms as you have now.

NetworkWorld

BUYER'S

SAN switches

GUIDE

#### *Feature:*

There's a SAN for every need.

Page 49.

#### *Review:*

Brocade's SilkWorm switches win our SAN switch test.

Page 52.

#### *Online:*

Our interactive Buyer's Guide chart includes SAN products from 23 vendors. DocFinder: 7625



The software should contain data replication and third-party copy facilities, and support the discovery and monitoring of host bus adapters, hubs, switches, routers, disk arrays and the like. It should also include a method for monitoring events and reporting up to a framework product such as Tivoli's Management Environment, Computer Associates' UniCenter-TNG or Hewlett-Packard's OpenView.

Further, the software should monitor storage resources and capacity as well as let the administrator know when more storage is needed.

Vendors are looking to manage physical storage with SNMP and logical storage resources with the Common Information Model. Key to any management tool, however, is the ability to manage storage from the same console as the rest of the network. During the next year, storage management, which analysts say accounts for seven to eight times the cost of storage, will boom.

#### Market on the rise

Dataquest of Stamford, Conn., estimates the market for storage management software will hit \$4.8 billion by 2002. Among vendors with storage management software are Veritas, Legato, Highground Systems and system vendors such as Compaq, EMC, HP and IBM.

You may also want to use storage domain or disk virtualization software/hardware, which lets you increase utilization by parsing up a disk array into multiple volumes that can be shared by different NT, Unix and Linux servers. Software of this type is just appearing and is available from XIOtech, DataCore Software, Compaq and Gadzoox.

If you are looking to replicate data to a remote location for disaster recovery purposes or to connect SANs across geographically remote locations, you have a variety of options. Network infrastructure vendor CNT has many products that will let you bridge the chasm between two identical SANs or copy data between locations. EMC, Legato, LiveVault, Compaq and other companies have software that lets you replicate data across distances over dial-up IP lines, or dedicated lines using T-1 lines or ATM. In addition, several other vendors, such as Gadzoox and Vixel, are working on packages with Lucent, Nortel Networks and Cisco to join geographically distant SANs over metropolitan-area networks using dense wave division multiplexing.

Once you know the functionality you need, you'll want to have a clear idea of the storage components and servers you can reuse in the SAN before you choose a vendor to implement the hardware/software storage

package. Because building a SAN is not yet a plug-and-play market with commodity hardware, you would be wise to cozy up with an integrator such as Sterling Software or a vendor

such as Compaq that can supply an end-to-end data network that will solve your problem.

Compaq, Dell, EMC, HP, IBM, ADIC and XIOtech offer comprehensive

SAN systems. Investigate the offerings of vendors, ask them to put the SAN you choose to a money-back test, and know clearly what the SAN needs to do now and two years in the future. ■

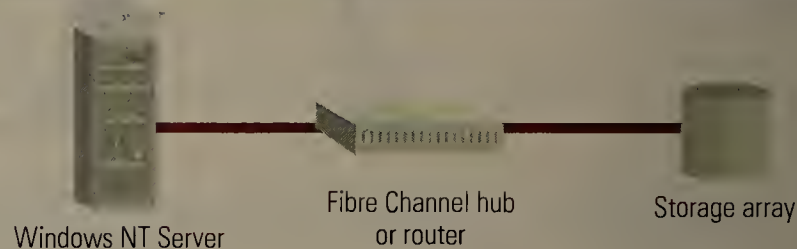
### Speaking SAN

They might as well call it SANskrit. The SAN industry has adopted its own lingo, which embodies many of the same terms and functions long used in traditional packet-based data networking. Here are some key SAN terms and their equivalents in the world of conventional networking:

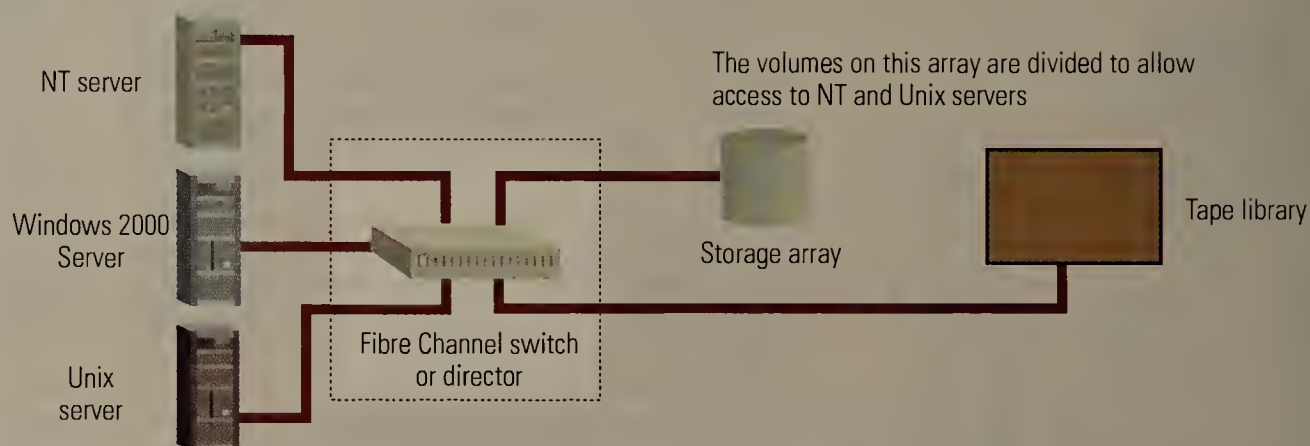
What they say in "SAN"	What it means:	Equivalent term in normal network vernacular:
<b>Fabric</b>	Uses switching, rather than older "hubs"	Switch, switched
<b>HBA</b>	Host bus adapter	Network interface card, adapter card
<b>Loop or FCAL</b>	Fibre Channel Arbitrated Loop; kind of like token ring	Hub, shared bandwidth ring
<b>Zone, zoning</b>	Logical isolation of a port or SAN-attached devices	Virtual LAN
<b>LIP or FLOGI</b>	Link Initialization Protocol, Fabric Log-In address learning	Autosensing
<b>Client</b>	Any computer node connected to a SAN (as in NT, what you'd typically attach to a SAN)	Server

### SANs come in three levels of complexity

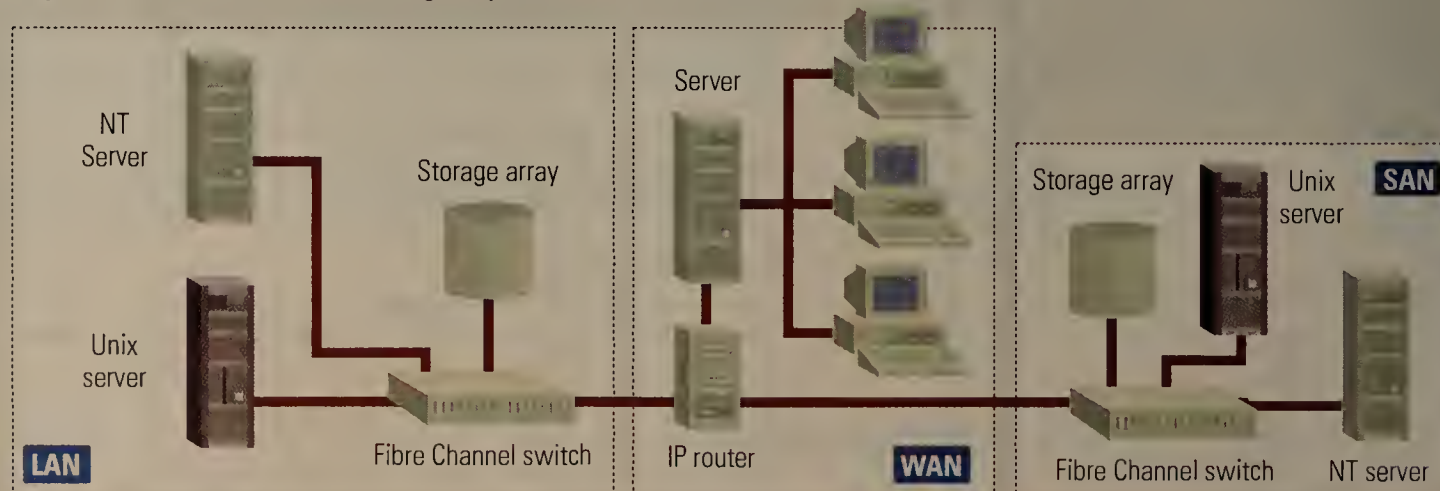
#### 1 Point-to-point arbitrated loop:



#### 2 Multiport switched-fabric Fibre Channel SAN:



#### 3 Two Fibre Channel SANs bridged by an IP-based LAN:





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from a lively exchange  
approaching**

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# SANity check

**Brocade's  
SilkWorm SAN  
switches offer  
best performance,  
plug-and-play  
features.**

# W

BY EDWIN MIER AND KENNETH PERCY

hen you enter the world of storage-area networks (SAN), you may want to check all you know about data networking at the door. SANs represent an offshoot branch of networking that, whether by design or happenstance, has become a unique world unto itself.

Even so, SAN switches — which power SANs just as Ethernet switches and IP routers drive traditional data networks — can still be quantitatively tested and compared. The latest wares from four leading SAN switch vendors are quite different.

The Network World Blue Ribbon Award goes to Brocade Communications. The SilkWorm 2400 and 2800 SAN switches proved to be truly plug-and-play, and exhibited the best overall performance of the products tested.

QLogic placed second. While not as easy to get up and running as Brocade's SilkWorm SAN switches and exhibiting so-so performance, QLogic's SANbox 8 and SANbox 16 HA showed strength in its SANsurfer management, which we considered the best of the lot.

(QLogic acquired Ancor earlier this year, and the switches we tested came from Ancor before the acquisition was completed. We are assured by QLogic that its current switch products are essentially the same as the Ancor switches we tested.)

Each vendor — QLogic, Vixel and Brocade — with the exception of Gadzoox Networks, provided two switches, an eight-port and a 16-port version. Performance of the eight- and 16-port versions of each vendor's switch was extremely close, letting us group the performance figures by vendor, rather than reporting on a switch-by-switch basis. Because scores for installation, performance, manageability and features were about the same within each vendor's product line, we could rate the switches by vendor, rather than individually. That's why there are only four, rather than seven, scores on the NetResults Scorecard.



## Rating SAN switches

We evaluated the SAN switches in five categories:

- Performance, comprising a dozen measurements and metrics, including latency, through one switch as well as a multiswitch fabric; automatic failover, representing the case in which a switch or an inter-switch link (ISL) fails; throughput, which we tested with one to seven Windows NT servers, performing disk reads, writes, and then a mix of reads and writes across the SAN fabric; and overall stability.

- Management and administration, including intuitiveness and effectiveness of the management interfaces — graphical user interfaces as well as command-line interfaces; real-time monitoring capabilities; and additional management capabilities such as event, alarm or trap logging (files in which events, alarms and traps are stored) and the generation of management reports.

- Configuration, with criteria including support for multiswitch, mesh topologies; per-port frame buffers; different Fibre Channel classes of service; connection types — such as fabric (direct, switched) and older loop (shared-

Continued on page 54

## Online

Online: See products for building a storage-area network from these 23 vendors featured in *Network World's* interactive Buyer's Guide database.

- |                                |                      |
|--------------------------------|----------------------|
| • Advanced Digital Information | • Interphase         |
| • Ancor Communications         | • LAND-5             |
| • Brocade Communications       | • McDATA             |
| • Cambex                       | • nStor Technologies |
| • Ciprico                      | • QLogic             |
| • Dot Hill Systems             | • Solid Data Systems |
| • EMC                          | • Storage Concepts   |
| • Emulex                       | • Vixel              |
| • Eurologic Systems            | • VMIC               |
| • Gadzoox Networks             | • XIOtech            |
| • High Velocity Systems        | • Zzyzx Peripherals  |
| • IBM                          |                      |



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*Interventionless Infrastructure Management*



Continued from page 52

bandwidth) connections; port density; modularity; hot-swappability; and a secondary, back-up power supply (an important redundancy option).

- Features, including support for the various Fibre Channel physical interfaces; multiple ISLs for load sharing and/or failover; and zoning.

- Installation and ease of use, including the degree of plug and play for connecting storage systems and servers; and documentation, including interoperability details.

### Loop vs. fabric

Vendors submitted four switches, two of each model, for testing. Four was the minimum number of switches we needed to set up a multswitch fabric with alternate routes and then test failover of a link. Except for Gadzoox, the vendors dutifully complied: QLogic, Brocade and Vixel sent us a mix of their respective eight- and 16-port switches. Other switch vendors were invited to submit switches, but either did not respond to, or declined, our invitation.

Gadzoox submitted its Capellix 2000G, which the vendor describes as a loop switch. That means the ports on the switch support only loop-type

device connections. A loop connection, short for Fibre Channel Arbitrated Loop (FCAL), is an older Fibre Channel connection arrangement in which multiple nodes share the bandwidth of a common transmission channel.

However, to interconnect multiple SAN switches, each switch has to support switched, or fabric, connections on at least some of its ports. The loop vs. fabric difference in SANs is akin to the hub vs. switch evolution of Ethernet. Before Ethernet switches came along, devices on the same Ethernet LAN shared the bandwidth of a common coaxial cable or hub.

The lack of support for fabric connections and multswitch topologies hurt Gadzoox's scores in the configuration and features categories. Using only one switch, users cannot deploy high-availability, alternate-route topologies. A single-switch Gadzoox SAN would be limited to a maximum of 11 ports (the Capellix 2000G comes with eight ports, plus an option slot that accepts a three-port expansion module). Gadzoox says it has developed a Fabric Switch Module designed to plug in to another modular switch model, the Capellix 3000. They were not available for our testing.

### Commonality

While performance and management aspects differed considerably, the SAN switches tested had many features in common. For example, the switches all featured Gigabit Interface Converter (GBIC) modularity for all ports. This lets the user readily swap the physical connector of the port. We often switched between copper DB-9 Fibre Channel ports and short-wavelength optical ports to test optical and copper configurations. The vendors all offered both GBIC types, as well as other Fibre Channel physical GBICs, such as those designed for long-wavelength/single-mode fiber transmission. We intermingled GBICs from each vendor with switches from each vendor (for example, a Gadzoox GBIC in a QLogic switch), and experienced no performance or compatibility problems. It appeared that as far as GBICs and GBIC ports are concerned, these devices really are plug-and-play.

All switches supported the same 1G bit/sec transmission rate on all ports, although Fibre Channel specifications have also been defined for 2G bit/sec transmission. A 4G bit/sec Fibre Channel specification is also reportedly now in the works.

All the switches featured a 10/100 autosensing Ethernet port for man-

agement access. Brocade, Vixel and Gadzoox all offered a console port, which is the way the IP address is typically entered for management access. In QLogic's case, an IP address is predefined, which we thought was somewhat awkward. The user has to keep track of this prespecified IP address, and go in later and change it to a different IP address, one that's appropriate for the user's particular IP network.

All the switches also supported zoning to roughly the same extent. Zoning is the SAN equivalent of a virtual LAN, which is where ports and the switch's attached nodes can be logically isolated from others. Zoning is used primarily for traffic-control purposes.

In addition, all the switches also supported the same two classes of Fibre Channel service, Class 2 and 3. Class 3, which is an unacknowledged, connectionless service, accounts for virtually all the traffic carried via SANs today. Class 2, also connectionless but with acknowledgements, is not widely used.

### Configuration comparison

In the configuration category, we awarded the top rating to Brocade's SilkWorm SAN switches. The

## NetResults

SilkWorm 2400 (eight port)



- SilkWorm 2400 (eight port)
- SilkWorm 2800 (16 port)
- Firmware FabricOS 2.1.7
- Brocade Web Tools 2.17 management

SANbox 8 (eight port)



- SANbox 8 (eight port)
- SANbox 16 HA (16 port)
- Firmware 3.033
- SANsurfer 2.07.30 management

7200 switch (16 port)



- 7100 switch (eight port)
- 7200 switch (16 port)
- Firmware 2.0 and
- SAN InSite 2000 3.0 (beta) management

Capellix 2000G



- Capellix 2000G (eight base ports, plus three via plug-in module)
- Firmware 1.1
- Ventana SANtools 1.1 management

**RATING: 8.40 COMPANY:** Brocade Communications (408) 487-8000, www.brocade.com. **COST:** \$1,381 to \$1,488 per port with DB-9 copper ports; \$1,621 to \$1,728 per port with multimode optical ports. **PROS:** Real plug and play; best performance; redundant power in all switch models. **CONS:** No online help with management interface; CLI is difficult.

**RATING: 7.05 COMPANY:** QLogic (952) 932-4000, www.qlogic.com. **COST:** \$1,350 to \$1,537 per port with all DB-9 copper ports; \$1,630 to \$1,817 per port with all multimode optical ports. **PROS:** Best management of products tested; automatic load balancing. **CONS:** Difficult to get up and running; no console port.

**RATING: 6.70 COMPANY:** Vixel (425) 806-5509, www.vixel.com. **COST:** \$1,124 to \$1,248 per port with all DB-9 copper ports; \$1,215 to \$1,244 per port with all multimode optical ports. **PROS:** High port density; nice event logon management interface. **CONS:** Inconsistent performance; hard to get up and running.

**RATING: 6.40 COMPANY:** Gadzoox Networks (408) 360-4950, www.gadzoox.com. **COST:** \$732 or \$845 per port for 11 or eight DB-9 copper ports; \$932 or \$1,120 per port for 11 or eight multimode optical ports. **PROS:** Supports three-port expansion module; fast and easy to get up and running; good performance. **CONS:** No multswitch fabric support; no redundant power supply option.

	Performance 25%	Management/ administration 20%	Configuration 20%	Features 20%	Ease of use and setup 15%	Total score
Brocade	9	7	9	8	9	8.40
QLogic	7	8	6	8	6	7.05
Vixel	7	6	8	7	5	6.70
Gadzoox	8	5	5	6	8	6.40



SilkWorm switches supported all the configuration criteria we looked for — multiswitch topologies, fabric and loop support, GBICs, console port and 10/100 autosensing Ethernet access. In addition, only Brocade offered a redundant power supply for its switch models, both eight- and 16-port. QLogic supports redundant power, but only on its 16-port model, the SANbox 16 HA. Neither Gadzoox nor Vixel offered redundant power for the switches they submitted.

Frame buffering, in which the switch temporarily holds onto transiting data frames, is another issue we explored. It helps ensure that frames aren't lost or dropped when unusual events or traffic conditions occur. We checked to see how much buffering the switches implemented on a per-port basis. Gadzoox doesn't employ any frame buffers. QLogic's SANbox switches have eight frame buffers per port. Brocade's SilkWorm switches have 16 per port, but also employs a dynamic buffer pool, which allocates additional buffer memory to ports as needed. Vixel's 7100 switch has 32 frame buffers per port.

There was less disparity in our assessment of features. A major distinguishing factor was the vendor's documentation of interoperability. We asked the vendors to send us whatever documentation and notes they offer to customers regarding interoperability of their switches with other SAN switches, storage systems and host bus adapters (HBA) — the SAN term for the Fibre Channel network interface card that goes into SAN-attached servers.

None of the vendors offered much in terms of working with other vendors' SAN switches. Brocade stated it does not claim any interoperability with any other SAN switches. QLogic, Vixel and Gadzoox were more ambiguous about interoperability. For storage systems and HBAs, Brocade had the most specific details, indicating it works on assuring customers that it interoperates with specific HBAs and storage systems. QLogic offered some specific details.

#### Plug and play?

The main criteria in our scoring of installation and ease of use was how long it took to get the vendor's switches up and running, whether we could readily connect our storage system and HBAs, and the problems we encountered along the way.

We used the same QLogic HBAs for testing all the switches. It is not clear whether a different HBA would have resulted in performance or compatibility issues, however, because SAN interoperability is still

evolving. Thus, your mileage may vary if you use other HBAs or Just a Bunch of Disks (JBOD) with the switches tested.

Brocade's SilkWorm 2400 and 2800 were truly plug-and-play, and received the highest scores. The next-most plug-and-playable was Gadzoox's Capellix 2000G. Gadzoox, however, avoided the complexity of a multiswitch topology — although everything connected and worked on the one switch on the first try.

Vixel's 7100 and 7200 and, to a lesser extent, QLogic's SANbox switches, experienced considerable start-up problems. We aren't sure why, and it seemed the companies' tech support people weren't sure, either. (The vendors each had at least one tech support person on-site at the test lab at some point during the testing.) We believe the problems related to subtle interoperability issues between SAN switches, adapters and storage systems.

#### Management

We were most impressed with the QLogic's switch management. The SANsurfer Web/Java-based software was clean, intuitive and stable. An automatic topology map shows how the multiswitch fabric is interconnected, down to the port level. Traffic levels are accurately displayed in real time and there's a good, legible event log.

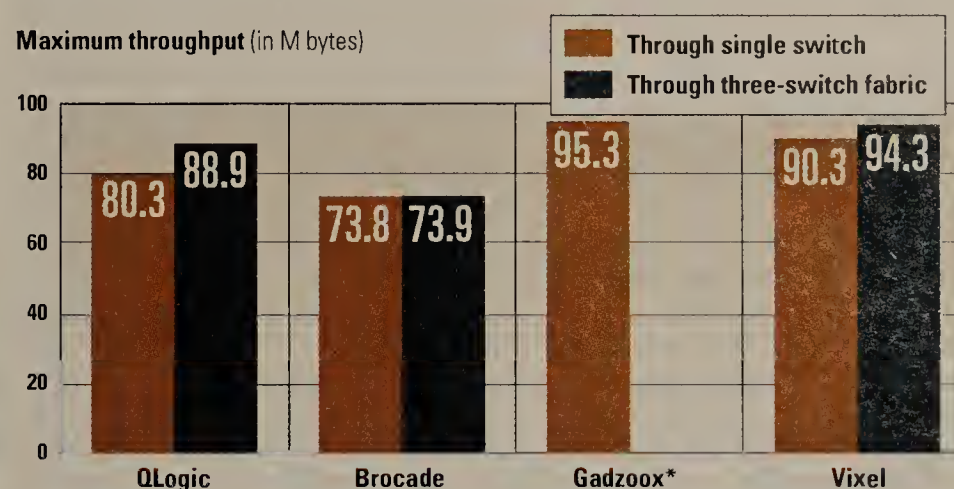
Brocade's Web Tools Java-based management was reliable and effective, but not as informative or feature rich as that of QLogic. There was no topology diagram, and we could not readily discern from the management interface what types of physical ports were on the switches. Reporting of traffic statistics was good, but there's no online help, which was sorely needed in a few areas.

Vixel's SAN InSite switch management, also Java-based, featured a good event log. The software involves multiple client and server pieces, which we thought was complicated. We evaluated a late beta version of the vendor's SAN InSite 2000 3.0, and we encountered more than a few bugs. In one case, a switch port was consistently reported as DB-9/copper when it was optical fiber. There are many nice features with the package, including excellent online help. However, the whole management interface operated erratically. At one point real-time traffic reporting stopped, and we were unable to re-establish or fix it.

Gadzoox's Java-based management utility, Ventana SANtools, was leaner than the others with regards to graphics and features. For example, there was no capability for real-

Figure 1 - Max throughput, 10M-byte reads

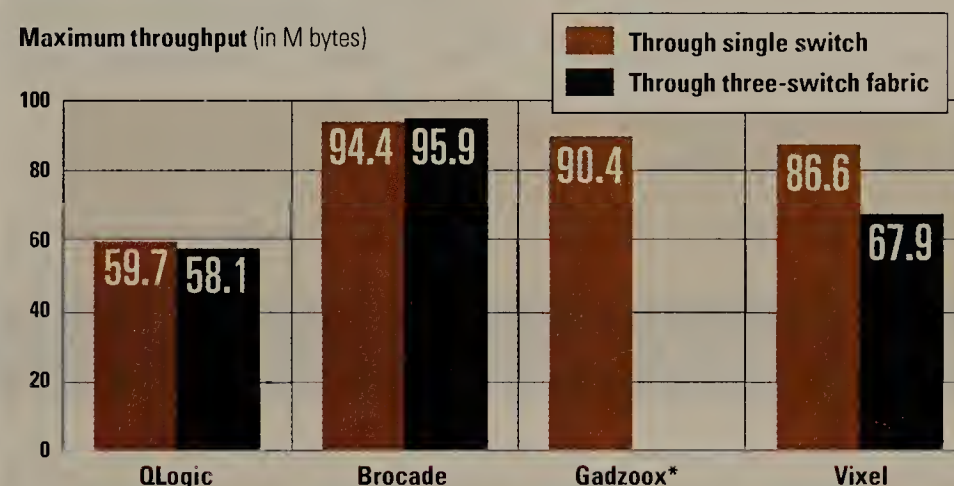
Maximum throughput for reads on a seven-server, on-target disk system. Tests were run through a switch. With the exception of Gadzoox, tests were also run through a three-switch fabric.



\*Gadzoox supported only single switch topologies when tested in July. A Gadzoox Fabric Switch Module was reportedly in beta testing, but not available for our testing.

Figure 2 - Max throughput, 10M-byte writes

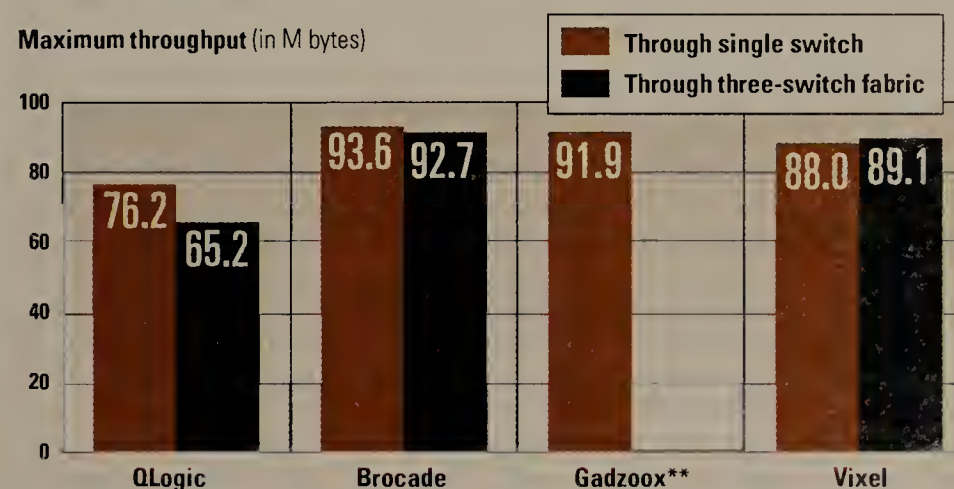
Maximum throughput for writes on a seven-server, one-target disk system. Tests were run through a single switch. With the exception of Gadzoox, tests were also run through a three-switch fabric.



\*Gadzoox supported only single switch topologies when tested in July. A Gadzoox Fabric Switch Module was reportedly in beta testing, but not available for our tests.

Figure 3 - Max throughput, reads and writes\*

Maximum throughput for reads and writes on a seven-server, one-target disk system. Tests were run through a single switch. With the exception of Gadzoox, tests were also run through a three-switch fabric.



\*Each of the seven servers was set up to perform 10M byte reads and writes — 50% of each, in a random order — across the SAN fabric, to the same SAN attached disk subsystem.

\*\*Gadzoox supported only single switch topologies when tested in July. A Gadzoox Fabric Switch Module was reportedly in beta testing, but not available for our tests.



time monitoring of traffic statistics. We also encountered some issues relating to the layout and navigation of the interface. There is some online help, but no option to search through the help file.

## Performance

The first of our performance tests, measuring the latency of transiting data, turned out to be a nonissue. All the switches imposed less than 15 msec of delay on data passing through their multiswitch fabrics. QLogic's SANbox, Brocade's SilkWorm and Vixel's 7100 and 7200 ranged between 10 and 15 msec. The latency of Gadzoox's Capellix 2000G was less because there was just one switch to go through.

What about when the switch is being bombarded with data? We clocked the average elapsed time for seven NT servers to perform 10M-byte disk reads and writes — in random order — to a disk-storage system across the SAN switch fabric.

The average transaction times of the SilkWorm, Capellix 2000G and Vixel 7100 and 7200 switches, at 1.515, 1.512 and 1.536 seconds, respectively, per I/O transaction, were nearly identical. The SANbox switches took a little longer, 2.177 seconds on average, to move the same amount of data under the same conditions. This number is signifi-

cant and could impact performance if there is a lot of traffic flowing over the SAN.

Throughputwise, we measured maximum throughput on the Fibre Channel link that connected our target disk-storage system to the SAN switch fabric. We then launched one to seven NT servers, conducting first reads, then writes, and then mixed reads and writes, to the storage system across the SAN switch fabric. (In the case of Gadzoox's Capellix 2000G, the servers and disk storage were connected to the same single switch.)

For one server writing to the disk system, throughputs were nearly identical for all switches. They handled on average between 77.8 and 79.6M byte/sec, a difference that was statistically insignificant. The same was true with server performing reads; average throughputs ranged from 81.6 to 85.1M byte/sec.

However, with seven servers performing disk reads at the same time, differences began to appear. The Capellix 2000G and Vixel 7100 and 7200 switches averaged 95.3 and 94.3M byte/sec, which nears the 100M byte/sec maximum capacity of Fibre Channel. The SANbox and SilkWorm switches lagged behind with 88.9 and 73.9M byte/sec average throughputs, respectively.

However, in other comparative

throughput tests — with the servers performing disk writes, and mixed reads and writes — SilkWorm emerged with the highest average throughputs. The Capellix 2000G came in second, and the Vixel 7100 and 7200 placed third. The SANbox consistently came in last. The concurrent reads-and-writes environment is closest to a real-world environment that users are likely to see.

Two other tests yielded surprising results: disconnection and reconnection of the target disk subsystem from the switch fabric with no traffic running, and fail-over of a switch in a multiswitch SAN fabric with full traffic running between multiple servers and the disk system.

The SilkWorm switches and the Capellix 2000G had no problems with the disconnection and reconnection of the disk system. However, Vixel's multiswitch fabric would not accept and recover from the topology change. Sometimes QLogic's SANbox switch fabric would accept the interruption, then reinitialize and coalesce, while other times it would not. Again, there was no traffic running during this test.

The fail-over test could not be conducted with the Capellix 2000G because the vendor did not support a multiswitch fabric. With full traffic running between seven servers and the disk system, the SilkWorm switch

fabric automatically failed over every time, the interruption lasting between 8 and 12 seconds. SANbox also failed over reliably under a heavy load. Because SANbox automatically balances the traffic load on the available routes through its multiswitch fabric, the interruption was barely noticeable. We think this is a plus for the SANbox design.

With light traffic from one server, the Vixel 7100 and 7200 switch fabric would fail-over reliably. However, under a heavy load from all the servers, Vixel's multiswitch fabric would not fail-over.

With all performance metrics considered, Brocade's SilkWorm 2400 and 2800 were the clear winners in this category followed by Gadzoox's Capellix 2000G.

Overall, Brocade's SilkWorm switches edged out the SAN switch competition, earning a total score of 8.4 on a 10-point scale. In Mier Communications' experience, we consider any product earning a total score more than 80% as a "recommended buy," and that is certainly the case here.

*Mier is president and founder of Mier Communications, a network consultancy and product test center in Princeton Junction, N.J. Percy is a test engineer at Mier Communications. They can be reached at ed@mier.com or kpercy@mier.com.*

## How we did it

The storage-area network test bed used the same traffic sources — seven Windows NT servers — the same Fibre Channel adapters (QLogic model QLA2200F/33) in the servers, and the same target disk subsystems for testing the SAN switches. That way, the only variable was the performance difference of the SAN switches under test.

Except for Gadzoox, the switch vendors each submitted four switches each, which we interconnected in a diamond topology. Gadzoox only provided one switch. We interconnected the switches to test the ability of the SAN switch fabric to failover and reroute traffic if a switch or an inter-switch link (ISL) fails. We also tested each vendor's switch in a single-switch environment, with servers and disk storage connected via the same switch. Gadzoox was not yet shipping support for multiswitch topologies at the time we tested, so testing with that vendor involved just a single-switch topology. While Gadzoox was reportedly beta-testing a new Fabric Switch Module, it was not available for our testing.

To generate traffic — in our case disk I/Os — we used one to seven servers running NT 4.0 with Service Pack 6a. These were identical Pentium III, 500-MHz machines with 128M bytes of RAM. The SAN server interfaces, or Host Bus Adapters (HBA), were adapters, each providing a Fibre Channel, short-wavelength fiber-optic con-

nect, and using the same drivers. The switch vendors were advised in advance of the testing, and accepted our decision to use the QLogic HBAs for the tests.

We installed a freeware software test tool from Intel, called IOMeter, on the servers. IOMeter is a workload generator and measurement tool that can execute disk I/O read and write loads, and meticulously report the performance results. This software tool lets one server station act as a master, controlling the set-up and execution of the tests with the other servers, then collecting and consolidating the performance data. We used IOMeter Version 1999.10.20.

For our I/O disk subsystem targets, we used two of Eurologic Systems' Eurologic XL-400 JBOD systems, each with seven 18G-byte Seagate Cheetah 18LP disk drives and a native Fibre Channel interface. The two JBODs were cascaded, yielding a total of 14 possible disk I/O targets.

To confirm the throughput performance and measure latency, we employed the Gigabit Traffic Analyzer (with a 256M-byte trace buffer) from Finisar.

For throughput, we tested one server initiator to four target disks — first through one switch, then through a multiswitch fabric. We then tested seven server initiators to 14 target disks again through one switch, and then through the multiswitch fabric. In each of the tests, we used the

IOMeter to generate 10M-byte reads, then writes, then a combination of 50% reads and 50% writes. At least three iterations of each test were performed, and for each test we recorded total I/Os per second (how many times the 10M-byte file could be written or read per second), total megabytes per second of throughput, and the average I/O response times (elapsed time to complete a read or write, in milliseconds).


To measure latency, the Finisar Gigabit Traffic Analyzer time-stamped the first 10 SCSI commands issued by the server into the multiswitch SAN fabric, and then compared those with the time-stamp of the commands exiting the switch fabric. The average delta of the two times produced the latency measurement.

To measure failover time, we used IOMeter to generate 2K-byte random reads, from one initiator (server) to four disk targets, in a continuous stream. We then ascertained the active ISL and disconnected it. Then we launched random 10M-byte disk reads from seven initiators to 14 disk targets, and ascertained and disconnected the active link. For each test, the Finisar Gigabit Traffic Analyzer recorded the elapsed time from when traffic ceased to when it resumed.

We also ran some comparative tests of SAN performance involving NT-server back-up operations over a SAN, to a target tape system, rather than to disk drives.



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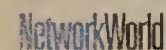
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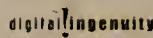
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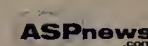
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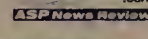
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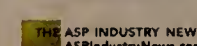
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## The road to CCIE

**This is the first of an IT pro's quarterly account of what it's like to go through Cisco's most rigorous certification program.**

BY JEFF SHAPIRO

When I pitched this concept to my editor she was sure I was nuts. Going from network know-nothing to Cisco Certified Internetwork Expert (CCIE) is an arduous and lengthy process. Yet here I was, proposing that I not only become a CCIE, but do it in a year and a half and write about my experiences every three months.

My quest started simply enough. I'm the technology coordinator for the Kingsport, Tenn., city schools and was in charge of a network upgrade at our high school. The Board of Education approved my plan to tear out the ancient token-ring network and replace it with Fast Ethernet and Gigabit Ethernet. We purchased about \$200,000 worth of Cisco 3500 and 3600 series switches and routers and my staff and I needed to learn how to configure and operate them.

Classroom training is the best way to learn about Cisco equipment, especially if you don't have any hands-on experience. Tuition ranges from \$1,595 to \$2,695 per class, with discounts available for repeat customers and companies that send multiple attendees. If the classroom option doesn't fit your budget or schedule, you can sign up for "e-learning" courses taught over the Internet. Cisco also offers self-paced online courses that may be a good choice for those who already have some hands-on experience.

I signed up with Cisco-certified training partner Global Knowledge to attend two courses. The introductory course is called Interconnecting Cisco Network Devices — that's ICND at acronym-happy Cisco. The closest Global Knowledge office to my home is in Atlanta, and it's a top-notch facility with big classrooms, wide screen projectors and comfort-

able workspaces.

When I arrived at the training center this spring, I found a mound of materials waiting for me. Cisco supplies manuals with presentation slides, footnotes, additional information and hands-on exercises, but most training vendors supplement these materials with their own. Global Knowledge provides a large book of detailed replacement hands-on exercises.

Cisco requires its instructors to hold the Cisco Certified Training Instructor designation, so the teaching quality is likely to be good wherever you go. Our instructor was no exception. Five days of intense, gratifying work seemed to fly by. At the end of the week, I believed I understood what I was doing.

The class learned a lot, including how to configure multiple protocols, set and change options, diagnose and troubleshoot problems, and integrate routers and switches into large networks. We participated in exercises to model a global network with each two-person team representing a country. The group also simulated ISDN and frame relay networks using the only non-Cisco equipment in the lab, an Adtran Atlas 500 Integrated Access Device.

A few weeks later, I took the second class, Building Cisco Multilayer Switched Networks. My schedule required me to travel to another Global Knowledge site in Orlando. Because the course was held in a rented facility, the equipment arrived in wheeled plastic cases with 19 inch racks permanently mounted inside. Just pop the doors off, plug the racks in, and *voila*, instant network. Five days later my head had been stuffed with volumes of new information. At this point, I had learned what I needed to become a Cisco Certified Network Associate (CCNA), Cisco's lower-level certification.

I returned to Orlando in July to attend Networkers, the annual Cisco user conference. If you plan in



Jeff Shapiro of Kingsport city schools spent his summer obtaining CCNA certification.

advance, you can arrange to take a number of certification exams at Networkers for free. Spots fill up fast, but there are also a limited amount of walk-in tests for \$50, half the usual price. I registered too late to get a free CCNA exam, but got a walk-in slot for 7 a.m. on a Saturday, the last day of the conference.

Testing firm Prometric conducts the automated testing. Depending on the exam, potential candidates must answer up to 90 multiple choice questions. Scoring is automatic and when you walk out of the room, you already know how you did.

As for me, it was close. I had inadvertently purchased test preparation software for an earlier version of the exam, so there were items on the test that I had never seen before. Nevertheless, I passed and am proud to report that I am now a CCNA. The next step is Cisco Certified Network Professional (CCNP), a stepping stone to the CCIE.

The second installment of this article series will cover certification requirements, exam format, study tools and preparation strategies.

*Shapiro is a CCNA and the technology coordinator for the Kingsport city schools in Kingsport, Tenn. He can be reached at [jshapiro@kpt.k12.tn.us](mailto:jshapiro@kpt.k12.tn.us).*

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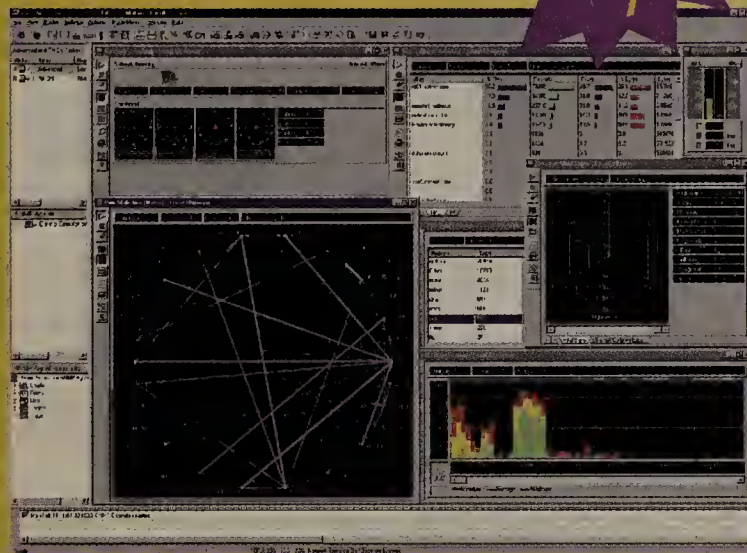


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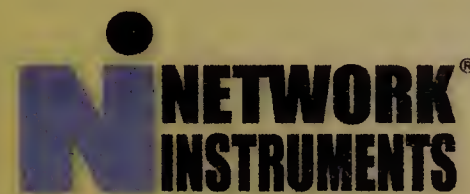
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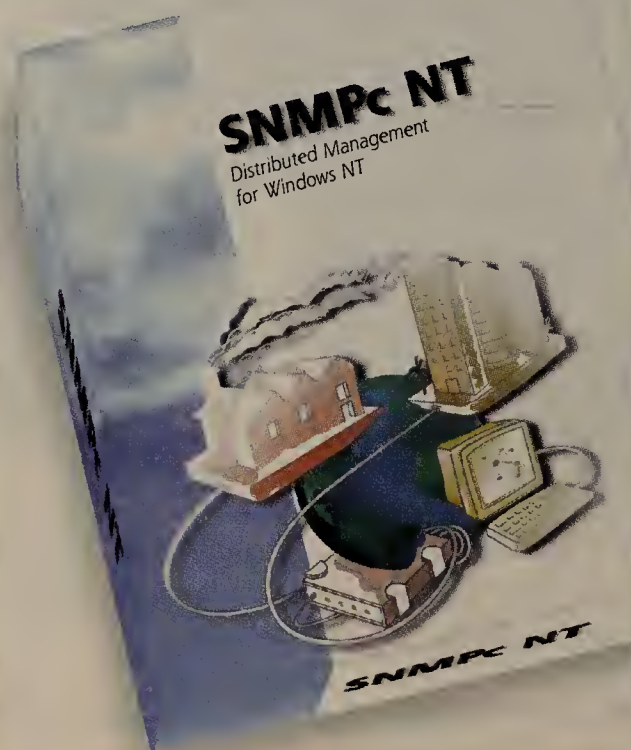
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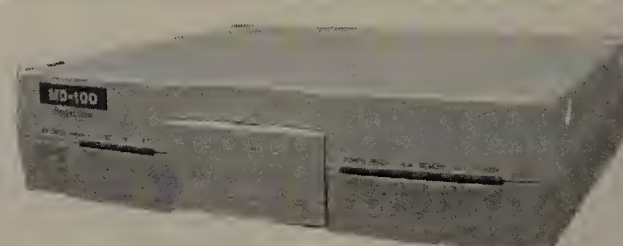
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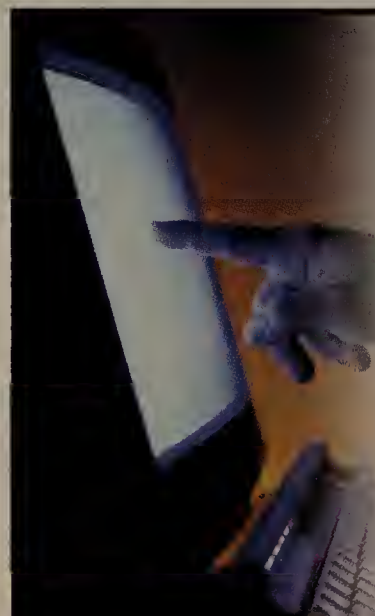
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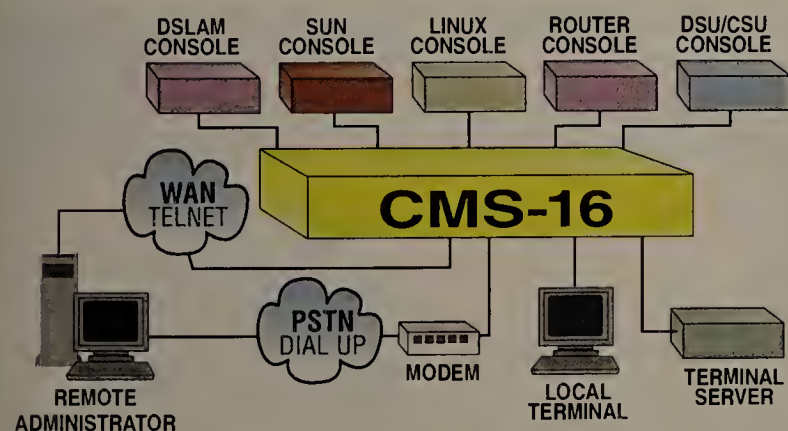
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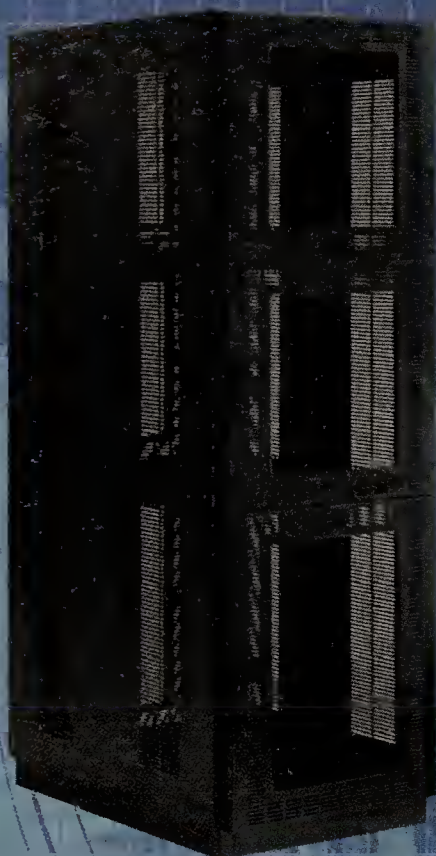
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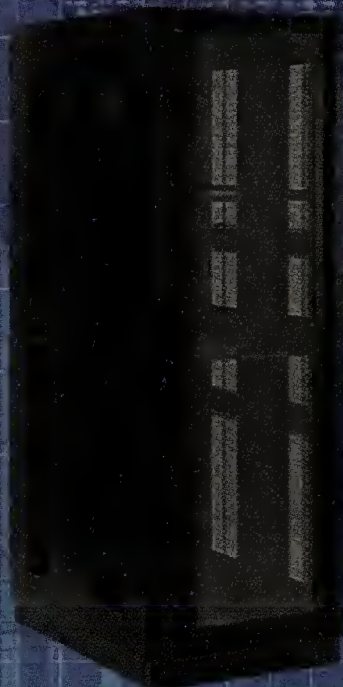
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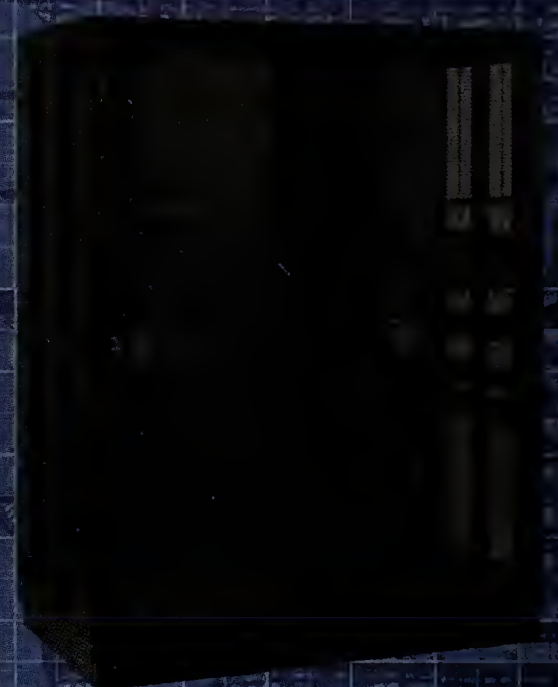
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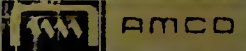


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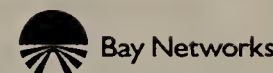
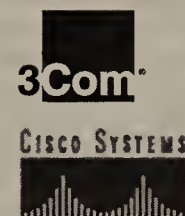
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 Please forward resume to NetGuru Systems, Inc. Attn: HR-LC-CW, 240 Bear Hill Rd., Ste. 101, Waltham, MA 02451.

Software Engineer wanted by Computing & Web Consulting Services Co in Hoboken, NJ. Must have Masters or equiv in Comp Sci or related field & 2 yrs prgmg exp. Respond to: HR Dept, Global Computing Services Corp, 51 Newark St, Ste 507, Hoboken, NJ 07030.

Software Engineers (multiple positions) sought by New Jersey based Comp S/ware Consultancy Firm. Must have Bach or equiv in Comp Sci or Engg & 1 yr s/ware exp. Respond to: HR Dept, SysFour Solutions, LLC, 3530 Route 27, Suite 203, Kendall Park, NJ 08824.

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Prog/Analysts w/BS + 3 yrs software development exp including 2 yrs w/C, C++, VB and/or Powerbuilder w/RDBMS. May have Masters + 2 yrs exp. Will develop all phases of software lifecycle. Must relocate to client sites. Contact HR at ESG, 9935 Timberstone Rd, Ste 200, Alpharetta, GA 30022.

Programmer Analyst wanted by Securities Trading Firm in Jersey City, NJ. Must have BS & 2 yrs exp in Comp Sci or directly related field. Respond to: HR Dept, Knight Securities, Inc., 525 Washington Blvd, Jersey City, NJ 07310.

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Database Design Analyst wanted by Staffing Services Co in Melville, NY. Must have MS or equiv in Electronics/ Engineering & 2 yrs comp exp. Respond to: HR Dept, ADO Staffing Inc., 19 Hanover Place, Ste 295, Hicksville, NY 11801. Fax (516) 433-6575.

Web Developer wanted by Software Dvlpt & e-commerce Co in New York, NY. Must have Masters in Electrical Engg, Comp Sci or Math & 1 yr exp dvlpg web-sites. Respond to: Deborah, Fax: (212) 441-5843.

Technical Consultant wanted by S/ware Products & Services Firm in Cambridge, MA. Must have MS in Computer Science & 3 mos s/ware exp. Respond to: Ellen Murphy, HR Dept, Agency Interactive Management, Inc., 25 First St., Cambridge, MA 02141.

Analyst/Programmer (multiple openings) sought by Connecticut based Comp Consulting & Hardware Sales Co for job opening in Shelton, CT. Must have at least Bach in Comp Sci, Engg or related field & 3 yrs exp in software/engg/mathematics or related field. Respond to Personnel, SAI Systems International, Inc., 915 Bridgeport Ave, Shelton, CT 06484.

Systems Analyst wanted by S/ware Dvlpt Firm in Hackensack, NJ. Must have Masters in Comp Sci or Elec Engg & 1 yr exp dvlpg, modifying, coding & testing complex systems & programs in SQL envrmt, implementing load balancing for web server using VB & VC++ tools for data transfer & image conversion. Respond to: HR Dept, American Heritage Group, Ltd., Three University Plaza, Ste 16, Hackensack, NJ 07601

System Analyst wanted by Computer Software Consultancy Co in Edison, NJ. Must have Bachelor's or equiv in Comp Sci or Engg & 3 yrs exp dsgng, dvlpg & implementing client server & Internet/intranet e-commerce applies using Object Oriented Technologies. Respond to: HR Dept, AK Systems, Inc., 100 Metroplex Dr, Ste 303, Edison, NJ 08817.

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Sr. Programmer Analyst, wanted by Securities Trading Firm in Jersey City, NJ. Must have BS in Comp Sci or directly related field & 5 yrs s/ware exp. Respond to: HR Dept, Knight Securities, Inc., 525 Washington Blvd, Jersey City, NJ 07310.

Programmer Analyst wanted by New Jersey based S/ware Dvlpt & Comp Consulting Firm for job locs throughout the US. Must have Bach in Engg, Sci, Comp Sci & 1 yr s/ware exp dvlpg Oracle database packages & implementing AIX Shell Scripts. Respond to: HR Dept, Datalog Technology Resources, Inc., 205 Cinder Rd, Edison, NJ 08820.

Programmer Analysts (Multiple Openings) sought by IT Consulting Co. in Brookline, MA for job locs throughout the Greater Boston area. Must have BS in Comp Sci, Applied Math or Engg and 2 yrs experience in any software development occupation. Respond by resume to: HR Dept, ICCT, 1842 Beacon St. Brookline, MA 02445.

SAP Specialist wanted by Computer Services Co in Edison, NJ. Must have Bach in Comp Sci, Comp Engg or Elec Engg & 1 yr exp dvlpg & coordinating quality improvement & operations planning projects w/SAP/3 implementation. Design, scripting, & configuration of MM & QM functionality. Integration between MM, FI, OM & PP. Respond to: HR Dept, Horizon Companies, Inc., 2025 Lincoln Hwy, Ste 322, Edison, NJ 08817.

Associate Technical Consultant wanted by Software Products & Services Firm in Cambridge, MA. Must have BS in Comp Sci & 2 mos. s/ware exp. Respond to: Ellen Murphy, HR Dept, Agency Interactive Management, Inc., 25 First St, Cambridge, MA 02141.

Chief Computer Programmer wanted by Hotel in Myrtle Beach, SC. Must have BS in Sci or Engg & 2 yrs exp in prgmg analysis. Respond to: Atlantic Paradise Inn, Inc., 1401 South Ocean Blvd, Myrtle Beach, SC 29577.

Software Configuration Manager (multiple openings) wanted by Software Configuration Mgmt Co in Redbank, NJ. Must have Masters in Comp Sci, Comp Engg. Respond to: HR Dept, Configuration Management, Inc., 140 Broad St, Redbank, NJ 07701.

Software Engineer wanted by Comp Solutions & Internet/Database Co in Farmington, CT. Must have Bach in Comp Sci or Elec Eng & 2 yrs IT exp. Respond to: Ad# App Dev-062000, HR Dept, Spellnet, LLC, 1577 New Britain Ave, Farmington, CT 06032.

Systems Analyst/Oracle Developer wanted. Must have Master's degree in Eng. or Comp. Sci. and 3 yrs. IT exp. or Bachelor's and 5 yrs. Respond to AD # IN-02, Attn. K. Parenti, ESPN Inc., One ESPN Plaza, Bristol, CT 06010. Fax 860-766-2425.

Software Engineers (multiple positions) sought by New Jersey based Comp S/ware Consultancy Firm for job loc in Philadelphia. Must have Bach or equiv in Comp Sci or Engg & 1 yr s/ware exp. Respond to: HR Dept, SysFour Solutions, LLC, 3530 Route 27, Ste 203, Kendall Park, NJ 08824.

Associate Applications Consultant wanted by Professional Services Firm in Boston, MA. Must have Masters in Bus Admin, MIS, CS or related & 1 yr LAN exp. Respond to: Jill Fioretti, HR Dept, Extraprise Group, Inc., 27 Melcher St, Boston, MA 02210.

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Programmer Analyst/Software Engineer-Bach deg in engg, technology, sci & 5 yrs exp in job. Will accept Masters deg & 3 yrs exp in field. Prefer exp in the following skill sets: Fortran, CMS, Win NT, Cobol, IBM/MVS.

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Software Engineer-Master deg & 1 yr exp. Analyze, dsng, dvlp applic systms using skill combo in Win NT, Novell Network, CISCO. Dvlp 2000, Oracle, SQL Server, VB.

Send resumes to Unique Comp Inc, 27-08 42nd Rd, Long Island City, NY 11101.

Network Engineer wanted by IS/IT Consulting Services Co in Edison, NJ. Must have Masters or equiv in Comp Sci, Electronics or Electrical Engg & 2 yrs s/ware exp. Respond to: HR Dept, Netcom Systems, Inc., 200 Metroplex Dr, 3rd Fl, Edison, NJ 08817.

Senior Quality Assurance Engineer: identify, create and implement project/test processes for quality assurance. Provide development and adoption of test plans within company test team plan. Design and execute system performance tests, both manual and automated. Develop and manage multiple communications including Release Notes, Bug discovery rates, and performance metrics. Support the creation of release management, build management and software maintenance methodology. Work with necessary web based automation solutions and actively develop test team. Requires: M.S. in Engineering or Technical field and 2 years Software Quality Assurance experience. Demonstrated ability using Win-Runner, QA Partner, and Visual SourceSafe, 40 hrs/wk (8 to 5); \$75,000/yr. Send two resumes/response to Case# 20002106, Labor Exchange Office, 19 Staniford Street, 1st Floor, Boston, MA 02114.

Shiva Software Inc., a NJ IT Co., is looking to fill up the following positions at their work sites in NY & NJ:

Programmer Analyst/Software Engineer - Bachelors degree in engineering (any), math, science and two years of experience in the job (or) five years of experience in the job. Will accept Bachelors degree + five years experience in the field. Prefer the experience in the following skill sets: ORACLE, ODBC, Developer 2000, Visual Basic, CICS, UNIX.

Software Engineer - Masters degree and one year of experience. Analyze, design, develop application systems using skill combinations in Visual Basic, UNIX, CICS, ORACLE, Developer 2000.

Send resumes to: Shiva Software Group, Inc, Human Resources, 1130 Route 46, Suite #8, Parsippany, NJ 07054.

Software Co, NJ requires prof'ts w/following skills for Sr/Jr positions:

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Senior Systems Analyst (Manhattan) Responsible for overall development, testing and implementation of client-server based ratings applications modules. Interact with users to determine and translate user/business needs into technical specifications. Analyze, code, test & design software systems. Utilize Oracle, SOL, SQL\*Plus, PL/SQL, C, NT, UNIX, Powerbuilder, and Pro\*C. Requirements: Bachelor's degree in Computer Science, Information Systems, Engineering, Mathematics, or Physics, 2 years in the position offered or 2 years as Senior Systems Engineer, at least one year of which must have included regular use of Oracle, SQL, SQL\*Plus, PL/SQL, C, NT, UNIX, Powerbuilder, and Pro\*C. Salary: \$78,721/yr. 35+ hrs/wk. Monday-Friday. Contact: Anna Romano, Associate Director, Human Resources, Standard & Poor's Rating Services (a division of McGraw-Hill Companies), 55 Water Street, New York, New York 10041.

Senior Consultant: Design and develop client/server application in open environment including designing and developing GUI and databases, performance systems analysis, and developing, testing, installing and maintaining customized systems. Analysis, design, development and implementation of three-tier objected client/server communications systems. Analyze and design business processes through data modeling and process modeling. Requires: M.S. in Computer Science and 3 years experience in developing client/server systems. Knowledge of UNIX, Windows NT, C, Oracle, systems programming and GUI development. 40 hrs/wk (9 to 6); \$78,500/yr. Send resume/response to Job Order #FL-2106893, Bureau of Workforce Program Support, P.O. Box 10869, Tallahassee, Florida 32302-0869.

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Applications Manager. Design, develop and implement Baan ERP applications using Baan ERP and Baan IV software on Windows NT and UNIX OS platforms. Create new companies using the Baan ERP system, add and delete users and generate desktops for employees. Determine business needs and design and develop software application solutions based on those needs. Install and test software patches and modifications and maintain an SQL server database and reporting tools. Requires: M.S. or foreign equivalent in Engineering, Computer Science or a closely related field. 2 yrs. exp. in the job offered or as a Business Consultant. Experience, which may have been obtained concurrently, must include 2 yr. exp. developing and implementing Baan ERP software applications. EOE. 40 hrs/wk. Salary: \$80,000/yr. Send resume (no calls) to: Michael Green, Synbiotics Corporation, 11011 Via Frontera, San Diego, CA 92127.

Programmer - Bachelors in Computer Science or equivalent required. Minimum of two years experience in Visual Basic 5 or 6, 2 years experience in C++ and 1 year experience in SQL Server database design. Position located in Boulder, Colorado. Email resume with references to [rseale@gbsinc.com](mailto:rseale@gbsinc.com)

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Senior Web Engineer/Programmer: Perform advanced computer engineering & programming to design & develop interactive Websites for commercial & institutional clients. Work in tandem with a Graphic Designer to design Website layouts & functions. Develop programming requirements & lay out programming schedules. Perform object-oriented programming & development (OOP/OOD) using Visual Studio, Visual C++ & Visual Basic. Engineer prototype websites, translating designs into functional technology, utilizing Javascript, Netscape Livewire, Oracle Web Agent/Web Request Broker, SDK, Server Management Tools, HTML/HTML 3.0, CGI Scripting, TCP/IP communications protocols. Integrate web modules into client's existing mainframe legacy systems (IBM, Tandem) & databases (SQL Server, Oracle). Meet with client management at specified intervals throughout each project lifecycle to review development stages & ensure that each project meets all product criteria & client specifications. 40 hrs/wk, 9 a.m. to 5 p.m. \$62,000/yr. Must have a B.S. degree in Computer Science & 2 yrs. experience in the position offered or as a Systems Analyst. Experience must include a) integration of Web & Internet technology into legacy (IBM, Tandem) systems, b) programming/analysis of SQL Server & Oracle databases, & c) OOP/OOD using Visual Studio, Visual C++ & Visual Basic. Applicants must show proof of legal authority to work in the U.S. SEND 2 COPIES OF BOTH RESUME AND COVER LETTER TO: ILLINOIS DEPARTMENT OF EMPLOYMENT SECURITY, 401 S. State St. - 7 North, Chicago, Illinois 60605, Attn: Leonard Boksa, Reference # V-IL 23110-B. NO CALLS. AN EMPLOYER PAID AD.

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Director Worldwide IT Infrastructure. Develop strategy for managing company's IT infrastructure, including internet, telecommunications, e-mail, software, notebooks and desktop computers & servers. Manage contracts with external IT providers and new contract selection & negotiation. Manage company's technology infrastructure, including outsourcing and management of computer operations. Participate in decision-making process regarding development of infrastructure. Establish metrics and manage relationship with third-party administrator. Serve as interface between in-house IS organization and third-party administrator. Oversee WAN management. Manage global messaging systems. Oversee activities of 3 staff employees. Requires: M.S. or foreign degree equiv. in Computer Science. 4 yrs. exp. in the job offered or as a Systems Eng./Facilities Management Consultant or Project Executive/Project Manager. Exp., which may have been obtained concurrently, must include 2 yrs. exp. in project and outsourcing management. EOE. 40 hrs/wk. Salary: \$112,378/yr. Send resume (no calls) to: Manager, HR Operations, Flowserve Corp., 222 W. Las Colinas Blvd., #1500, Irving, TX 75039

Sr. Internet Soft. Eng. Job location: Austin, TX. Duties: Administer Oracle & SQL Server Databases. Create & configure database servers. Perform capacity analysis, data migration, backup & recovery process. Load balancing database server. Optimize SQL Queries and establish database clients. Analyze, design, develop, implement & support application systems in a global client/server environment. Create database tables, indexes, constraints, stored procedures & triggers. Requires: M.S. or foreign equiv. plus 3 yrs exp. in the job offered or 3 yrs exp. in a Programmer/Systems Analyst position. In lieu of Master's degree and 3 yrs of exp., will accept a Bachelor's degree or foreign equiv. plus 5 yrs of progressive exp. Exp. which may have been obtained concurrently, must include: 2 yrs exp. developing and designing databases utilizing Oracle. Send resume to Teri Allen, marchFIRST, Inc., 311 S. Wacker Drive, Suite 3500, Chicago, IL 60606.

Network Engineer wanted by Info Technology Co for job loc in Madison, WI. Must have BS in Comp Sci, Comp Engg or related field & 2 yrs exp in network engg or related field. Respond to: HR Dept, Berbee Information Networks Corp, 5520 Research Park Dr, Madison, WI 53711.

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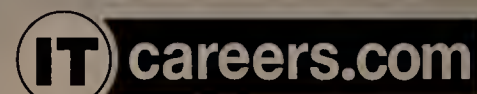
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Bob Wescott, Distribution Manager/(508)879-0700

### IOG LIST RENTAL SERVICES

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## Sales Offices

Carol Lasker, Associate Publisher/Vice President  
Debbie Lovell, National Sales Operations Manager  
Internet: [clasker, dlovell@nww.com](mailto:clasker@dlovell@nww.com)  
(508) 460-3333/FAX: (508) 460-1237

### NEW YORK/NEW JERSEY

Tom Davis, Associate Publisher, Eastern Region  
Elisa Della Rocca, Senior District Manager  
Elizabeth Ardzone, Account Executive  
Aimee Jacobs, Sales Assistant  
Internet: [tdavis, elisas, eardzone, ajacobs@nww.com](mailto:tdavis, elisas, eardzone, ajacobs@nww.com)  
(201) 587-0090/FAX: (201) 712-9786

### NORTHEAST

Donna Pomponi, Regional Sales Manager  
Kathryn Zinn, District Manager  
Linda Bishop, Sales Assistant  
Internet: [dpomponi, kzinn, lbishop@nww.com](mailto:dpomponi, kzinn, lbishop@nww.com)  
(508) 460-3333/FAX: (508) 460-1237

### MID-ATLANTIC

Jacqui DiBianca, Regional Sales Manager  
Lisa Londrillo, Sales Assistant  
Internet: [jdibian, llondrillo@nww.com](mailto:jdibian, llondrillo@nww.com)  
(610) 971-1530/FAX: (610) 975-0837

### MIDWEST/MARYLAND

Eric Danetz, District Manager  
Aimee Jacobs, Sales Assistant  
Internet: [edanetz, ajacobs@nww.com](mailto:edanetz, ajacobs@nww.com)  
(201) 587-0090/FAX: (201) 712-9786

### CENTRAL

Dan Gentile, Midwest Regional Director  
Kristin Baker, Fusion Coordinator/Sales Associate  
Internet: [dgentile, kbaker@nww.com](mailto:dgentile, kbaker@nww.com)  
(512) 249-2200/FAX: (512) 249-2202

### NORTHERN CALIFORNIA

Sandra Kupiec, Associate Publisher, Western Region  
Miles Dennison, Regional Sales Manager  
Lara Greenberg, Senior District Manager  
Sean Weglage, District Manager  
Lisa Otterson, Regional Sales Operations Manager/Account Exec.  
Carmella Baglione, Account Executive  
Anna Reyes, Sales Assistant  
Grant Turner, Sales Assistant  
Internet: [skupiec, mdennison, lgreenberg, sweglage, lotterson, cbaglione, areyes, gturner@nww.com](mailto:skupiec, mdennison, lgreenberg, sweglage, lotterson, cbaglione, areyes, gturner@nww.com)  
(650) 577-2700/FAX: (650) 341-6183

### NORTHWEST/ROCKIES

Carol Stiglic, Regional Sales Manager  
Karen Weiss, Regional Sales Manager  
Internet: [cstiglic, kweiss@nww.com](mailto:cstiglic, kweiss@nww.com)  
(650) 577-2700/FAX: (650) 341-6183

### SOUTHWEST

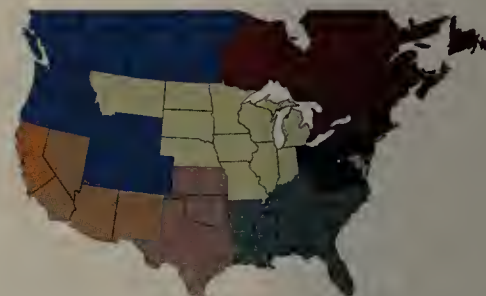
Becky Bogart Randell, District Manager  
Tiffany Wortham, Account Executive  
Joel Schwartz, Sales Assistant  
Internet: [brandell, twortham, jschwartz@nww.com](mailto:brandell, twortham, jschwartz@nww.com)  
(949) 250-3006/FAX: (949) 833-2857

### SOUTHEAST

Don Seay, Regional Sales Manager  
Terry Sanders, Sales Assistant/Account Executive  
Internet: [dseay, tsanders@nww.com](mailto:dseay, tsanders@nww.com)  
(404) 845-2887/FAX: (404) 250-1646

### FUSION

James Kalbach, Sales Manager  
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Internet: [jkalbach, jmschwartz, rkoenig@nww.com](mailto:jkalbach, jmschwartz, rkoenig@nww.com)  
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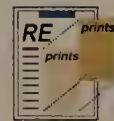


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Chris Gibney, Sales Operations Coordinator  
Internet: [rblack, kzannott, egubaie, cpeters, agaston, schin, cgibney@nww.com](mailto:rblack, kzannott, egubaie, cpeters, agaston, schin, cgibney@nww.com)  
(508) 460-3333/FAX: (508) 460-1192

### IT CAREERS

VP/General Manager, Janis Crowley, 650-312-0607, New England Sr. Account Manager, Nancy Mack, 508-370-0870, MidAtlantic Regional Manager, Deanne Holzer, 212-828-6691, Midwest Regional Manager, Laura Wilkinson, 773-248-4301, Midwest Account Manager, Donna Dugo, 312-587-1390, West Regional Manager, DeForest Smith, 650-312-0617, Senior Account Manager, Andrea Denny, 916-442-2334, West Account Manager, Whitney Nagy, 650-286-2732, East Regional Manager, Elizabeth Meyer, Marketing Director, Kelli Flanagan, 650-312-0544, Marketing Specialist, Chantelle Finney, 650-525-3450, Operations Manager, Donna Kent, 650-525-3457, Advertising Coordinator, Luan Nguyen, 650-312-0572, Midwest Sales Associate, Rochelle Caravaca, 650-312-0542, Eastern Sales Associate, Leilani Lopez, 650-312-0518, Western Sales Associate, Gloria Gonzales, 650-312-0521



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**Venture,**  
continued from page 1

Although overall investments were up significantly, the funding shifted dramatically away from e-commerce companies toward ventures offering Internet access and applications.

Among the hottest areas of investment were application service providers (ASP), broadband service providers and outsourcing companies offering enterprise-class Web-hosting and management services.

"The network area is still one of the bright spots," says Tracy Lefteroff, a managing partner of PricewaterhouseCoopers' venture capital practice. "This is going to continue to be a growth industry as everyone retools and re-equips their portion of the Internet backbone to accommodate new technologies coming out, like fiber optics, wireless and broadband."

The second quarter of 2000 was a record breaker on all measures. Altogether, 960 network companies received an average of \$15.6 million each during the second quarter. That's a significant increase over the first quarter, when 886 network companies received an average of \$14.1 million each.

The biggest increase for the quarter was in Internet applications and tool providers, which captured \$2.9 billion, up 35% over the previous quarter. Business service providers such as Web-hosting firms snared \$3

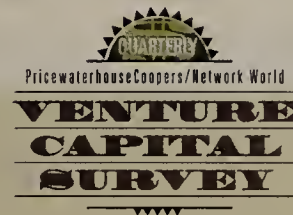
billion, up 24% over the last quarter. And access and infrastructure companies, including ISPs, captured \$1.9 billion, an increase of 11%.

"For corporate network managers, the trend is toward outsourcing," Lefteroff says. "As they bring Internet tools into

working," says Kirk Walden, national director of PricewaterhouseCoopers' Money Tree Survey, which tracks venture capital investments in all segments of the U.S. economy, including networking. "The companies that are getting funded are not companies that a

es (see graphic).

Industry observers see no end in sight to the amount of deal-making in the network area. Indeed, PricewaterhouseCoopers predicts that the net-



## Big deals

The largest investments of Q2:

Company	Location	Investment (in millions)	Description of business
Carolina Broadband	Charlotte, N.C.	\$402	Broadband services.
Formus Communications	Denver	\$175	Broadband ISP, CLEC services.
CoreExpress	St. Louis	\$172	Extranet service for business-to-business e-commerce.
Inflow	Denver	\$150	Web-hosting and connectivity services.
Cbeyond	Atlanta	\$141	Voice-over-IP services.
Global Metro Networks	Silver Spring, Md.	\$120	Dark fiber telecommunications networks.
Innomedia	San Jose	\$115.5	IP telephony services.
VeloCom	Englewood, Colo.	\$113	ISP services in Latin America.
Quantum Bridge	N. Andover, Mass.	\$102.5	Optical network equipment.
Mainstreet Hosting	Denver	\$100	Collocation, hosting and other services.
MimEcom	San Francisco	\$100	E-commerce Web site outsourcing services.

their own businesses, hosting and other services along those lines may be a better way to go than making all the investments internally."

Meanwhile, investments in business-to-business and business-to-consumer Web sites dropped to \$1.6 billion and \$1.4 billion from \$1.9 billion and \$1.5 billion, respectively.

"It's all about the business of the Internet, the business of net-

consumer might see. In sharp contrast to a Pets.com, consumers will never know who these companies are."

The biggest deal of the quarter was a whopping \$402 million invested in Carolina Broadband, a Charlotte, N.C., provider of broadband multimedia services, including cable TV, Internet access, and local and long-distance telephone services to residents and business-

work segment of the economy will end up raking in more than \$55 billion in venture capital funding by year-end — more than double the amount spent in 1999.

"We're going to see larger and larger deals," Walden predicts. "Venture capital firms have an incredible amount of money under management to invest, and it takes more money for them to do network deals, particularly telecommunications deals."

A growing number of those deals are for ASPs, including Asera, a Belmont, Calif., provider of hosted marketing and sales applications for manufacturers. Asera raked in \$98 million in venture funds from a group of top-tier investors including Kleiner Perkins Caufield & Byers, Chase Capital Partners and Cisco.

Other ASPs that got funding last quarter include EyeCast.com, a Herndon, Va., firm offering interactive video services that raised \$30 million, and Promptu Systems, a San Jose firm offer marketing services that raised \$17 million.

"Content distribution networks such as Inktomi and Akamai are becoming part of the Internet cloud," explains Gus Tai, a general partner with Trinity Ventures, which has invested in several ASPs, includ-

ing Promptu and Aventail. "There are going to be applications that are distributed on top of the Internet topology that enterprises are going to use to increase their interconnectivity."

Another group of companies that received a lot of money last quarter was providers of Web-hosting and management services. Two of the quarter's largest deals were \$150 million raised by Inflow, a Denver Web-hosting firm and \$100 million raised by Mainstreet Hosting, also of Denver.

"What the Exoduses of the world have been able to do is build out large-scale Internet operations, but there is currently a hole around value-added services," says Fred Wang, a general partner with Trinity Ventures, which has invested in SevenSpace, a Reston, Va., provider of outsourced management services for enterprise-class Internet applications.

## Networking hottie

Another hot area of investment was optical network gear. Among the companies that got funding last quarter were Astral Point Communications of Chelmsford, Mass., which received \$80 million; Tenor Networks of Acton, Mass., which received \$93 million; and Quantum Bridge Communications of North Andover, Mass., which received \$102.5 million.

Although these firms will sell their products to carriers, enterprise customers will benefit from the new and faster data communications services the equipment enables.

"If you look at the whole fiber-optics area — from components to wave division multiplexers — everything associated with that has just been on fire," Lefteroff says. "That area is going to be hot for a while because of the sheer magnitude of the job involved with upgrading the equipment along the backbone of the Internet."

Lefteroff adds that he is bullish on the network market for several years to come. "If you look at the successful companies in the public markets — Juniper, Avici, Foundry and Redback — and look at their sales growth, you can see that there's still a land grab going on in the Internet infrastructure," he says. ■

# Sprint throws big dollars into dial-up net

BY DENISE PAPPALARDO

Sprint last week announced that it is investing \$200 million to revamp its dial-up Internet access network, a move that is expected to make the network easier to access for customers and more manageable for Sprint.

The company, which currently covers about 80% of the U.S. with dial-up Internet access services, says the upgrade will boost availability to 90% of the country. In addition, Sprint says the Lucent equipment it is swapping for its old 3Com gear can handle many more calls, which should enable Sprint to consolidate its points of pres-

ence, now numbering around 300. "Lucent's gear has about 10 times more density than what we have in the network now," says Mike Grubbs, director of product management for Sprint Internet. And Lucent is expected to double, or even quadruple, the capacity of the APX 8000 Multiservice Access Switches Sprint is rolling out, he says.

The APX 8000s, along with Lucent's Softswitch Internet Call Diversion and NavisAccess software, will handle network provisioning, reporting and management of the dial-up IP network.

Sprint is outsourcing the entire project to Lucent's Net-

workCare Professional Services group, which should have most of the upgrade done by mid-2001. In the second half of next year, Sprint will concentrate on migrating existing customers to the new system, Grubbs says.

While Sprint offers dial-up Internet access and VPN services to corporate customers, the carrier generates most of its dial-up access revenue from selling to other service providers. According to Framingham, Mass.-based consulting firm IDC, Sprint's business Internet service revenue totaled \$180 million last year, while the company's wholesale offerings accounted for \$420 million in revenue. ■

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**Fraud,**  
continued from page 1

digit cardholder identification number that's printed on the back of their cards. This change, expected to go into effect next April, will require alterations to card-processing software and networks, MasterCard says.

"We're being more vigilant in monitoring those [Internet] transactions," says Vinnie DeLuca, MasterCard's vice president of fraud control. "Effective April 1, 2001, MasterCard will require the three-digit code called the Card Validation Code No. 2."

Internet merchants must then be prepared to request that three-digit code, which is identification for the cardholder that is not part of the regular credit card number. This three-digit number can be found on the plastic card but doesn't get printed out in a credit card receipt or processed through MasterCard's network today.

Visa also has a three-digit code on the back of its cards called the Card Verification Value, according to John Shaunessy, Visa's senior vice president of risk management. A merchant can request that code when the cardholder is not present to help validate the transaction. Currently, Visa won't mandate its use on the Internet. "We leave that up to the merchant," Shaunessy says.

Instead, Visa has formulated a 12-point list of security practices it wants online merchants, ISPs and third-party service providers processing credit cards to follow. These practices, aimed at preventing break-ins to steal card numbers from servers, include encrypting card data and using firewalls and antivirus software (see graphic).

"Visa has always had rules about storing data. A year ago, we knew we had to adapt to this new environment, with some of the hacking incidents and security breaches," Shaunessy explains. "We have come up with a list of requirements that will apply to all merchants, from the largest to the smallest."

The new rules about data security are expected to take effect by year-end.

"It's premature to suggest penalties for noncompliance,

but we are developing the capacity to monitor the security of merchants," Shaunessy warns, declining to reveal how Visa will do this monitoring. Merchants might even face loss of their Visa merchant card accounts if they fail to follow the new rules.

Gartner Group in Stamford, Conn. A Gartner survey of 100 Web retailers found Internet credit card fraud to be much more common than offline fraud, making it the "No. 1 problem" in e-commerce, Litner says.

Gartner found 44% of the

through freeware found on the Internet, says Tom Arnold, chief technology officer at CyberSource. "It's a no-brainer to generate all the credit card numbers associated with a particular bank," he says.

Moreover, the thieves are always developing new ways to trick e-merchants. "They'll aggressively phone to get the order approved, or they'll exploit an offer to get instant credit and open an account in your name," Arnold says. "They sometimes work in gangs, going after high-value goods like jewelry or computer equipment, moving it quickly once they have it."

Online travel service Expedia, which accepts credit cards for airline tickets and hotel reservations, earlier this year acknowledged that it had been victimized by gang-related card fraud to the tune of \$4.1 million.

"The fraud was committed by professional criminals who obtained the card numbers, not from Expedia or Expedia customers, but from elsewhere," says Suzi LeVine, the company's marketing director.

In the role as a travel agent, Expedia earns about \$10 on a \$300 plane trip booked for an airline carrier. But if the card number is bad, Expedia has to eat that full amount. Under U.S. law, consumers victimized by fraud are liable for \$50 of the charge, though merchants that fall for phony card numbers often waive even that amount.

A Brooklyn, N.Y., resident has been arrested and charged in connection with the Expedia case.

LeVine says Expedia has beefed up its fraud-screening

procedures, adding card risk-assessment software written in-house. LeVine says she welcomes efforts from Visa and MasterCard to counter the fraud problem. She added that Expedia already uses firewalls and other security procedures on Visa's best-practices list. Expedia's card-fraud problem wasn't due to a break-in; rather, fraudulent numbers coming over the Web didn't get screened out.

MasterCard's mandate next year to link a card number with the cardholder's ID number on the plastic card should work to authenticate a buyer's identity. However, because it's based on just a three-digit number, the Internet criminals may find a way to generate that ID number through software, too.

It's not the first time the card associations have tried to find a way to prove the buyer's identity on the Internet.

Three years ago, Visa and MasterCard claimed public-key encryption certificates based on a protocol called Secure Electronic Transactions (SET) would be the main way to make online card processing safer.

While public-key certificates were an ambitious project, the industry is still bogged down in technology-deployment problems, and consumers never got the certificates.

Though the card associations refute any notion that SET is dead, the idea lives on only in a few pilot projects. Meanwhile, the crooks grow more inventive each year. ■

## Visa's 12 Commandments

**Visa International wants e-merchants to follow these best practices, and the company plans to verify compliance:**

1. Install and maintain a working firewall.
2. Keep application and operating system security patches up to date.
3. Encrypt stored credit card data.
4. Encrypt data sent across the network.
5. Use and regularly update antivirus software.
6. Don't use vendor supplied defaults for password security.
7. Assign a unique user ID to each person with computer access.
8. Track access to data, including read only, by unique ID.
9. Regularly test security systems and processes.
10. Restrict access to data on a business "need to know" basis.
11. Have a management or human resources policy that addresses security in the workplace, such as doing background checks.
12. Restrict physical access to authorized employees.

While none of the credit card companies disclose exact loss-rate figures for fraud — in part because they aren't sure — Visa, MasterCard and American Express claim to have a handle on the problem overall.

"At Visa, it's as low as it's ever been; 6 cents on the dollar," Shaunessy says. "In 1992, it was 22 cents on the dollar due to magnetic-stripe counterfeiting."

Merchants are stuck paying for this fraud and also risk losing their accounts with the card companies if fraud rates get too high.

While American Express prefers not to discuss in depth how it combats Internet card fraud, both Visa and MasterCard believe such fraud is often the work of hackers who penetrate servers or databases that hold credit card numbers.

However, industry analysts and e-merchants claim the credit card companies have yet to come to grips with the full scope of the problem.

Internet-based card fraud is "at least 10 times the rate for the physical world," claims Avivah Litner, an analyst at

e-retailers built their own antifraud software, unless they were simply manually processing card numbers off the Web and making checks through phone calls and other means. That kind of software works by automatically submitting check-card numbers in Web-based purchases to known patterns of abuse to ascertain risk.

Many merchants are also beginning to use fraud-screening services and software that subject the card number to a risk assessment as the order is being placed on the Web, leaving the merchant to decide whether to accept the card number or not based on that value. CyberSource, Digital Courier, ClearCommerce and HNC Software are the leading vendors in this area, Litner says.

In Gartner's view, these services and software, which work by automatically screening the card number against a long list of checks, are still "very new" and the jury is out on their effectiveness.

Credit card thieves don't need to break into Web servers to steal card numbers; they can generate a supply of numbers

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# Compaq ends an era, retires the VAX

BY SAM COSTELLO

The message boards at open source software news site Slashdot.org read like a virtual wake last week, with friends gathering to trade anecdotes and share memories of the departed, after the news that Compaq is finally retiring its line of VAX servers.

The VAX's death was announced in a letter posted on Compaq's VAX Web site and on the site's product information page. The letter, written by Jesse Lipcon, vice president of Compaq's High Performance Server Division, explained the company's decision by saying it had "extended the VAX CPU technology as far as possible."

He also noted that many users had already replaced their VAX machines with higher-speed Alpha processor-based hardware.

"Thus, due to the rapidly diminishing demand for VAX hardware and the associated business viability, Compaq will be announcing last order and ship dates for its VAX hardware products," the letter said.

Compaq will accept its last VAX orders on Sept. 30 and ship its last VAX computer on Dec. 30. Though Lipcon's letter acknowledged that circumstances may change, it states that Compaq intends to offer technical support for the gear through 2010.

VAXes are servers, built originally by Digital, and now, after its purchase of Digital, by Compaq. The machines are tall — sometimes up to 5 feet — and their design has a distinct genealogical line to the room-filling systems of the 1950s and 1960s.

Employed for many of the same uses as their real estate-spanning ancestors, VAXes are still found in some corporations and often are used as power servers at colleges and universities. In their heyday — the 1970s and 1980s — VAXes were found everywhere heavy-duty computation was done.

"We lived by them," says Stephen Lane, the interim manager of desktop systems administration at Ithaca College in N.Y. "Everything you did was on the VAX."

VAXes did all the processing for the math and computer science departments in the early 1990s at Ithaca, Lane says, as well as human resources work, and it is only within the past two years that the school stopped using a VAX as its e-mail server.

Message boards at Slashdot, packed with tales from the past 25 years recounting the VAX's soon-to-be leg-

endary qualities, echoed Lane.

One Slashdot user, "InitZero," praised the stability of the VAX his company has been using for 28 years.

"At the height of production, we had more than 240 users on the system," InitZero wrote. "All with just 40M bytes of memory . . . I've been working on

this system for five years, and it's older than I am. In the last 11 years, we've not had a single minute of unscheduled downtime that has had a production impact."

*Costello is a correspondent with the IDG News Service's Boston bureau.*



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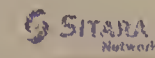
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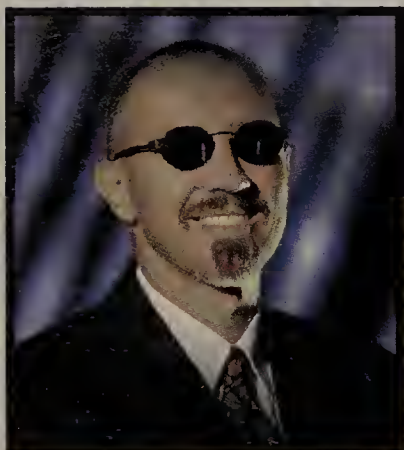


## The return of the lone columnist

Well how-deee! So that varmint, ol' Buzz McNamara, has bin bad mouthin' my thinkin' on Napster, eh? (See "Buzz's take on Napster," [www.nwfusion.com](http://www.nwfusion.com), DocFinder: 9533).

Goldarnit, Paul, many a better cowhand than you have tried to best The Lone Columnist. They've called me out to gun-fights and tried to ambush me, but none have had any more luck than a rattler in a deep-fat fryer and neither will you, pardner.

Don't expect to walk away from this rodeo. There's an ol' sayin' in the West: "If you mess with the bull, you get the horns." In the case of your column, you write the bull, you get the mud wrestlin'...



MARK  
GIBBS

So you're a-thinkin' that Napster is a wrong un', eh? Well leather my buckskins and call me a greenhorn if you have the slightest idea which way the herd is goin'.

Matter o' fact, that ol' Napster is, indeedy, more like an ISP than anything else. If your provider

were transporting illegal MP3s (which they undoubtedly are but equally undoubtedly aren't going to go looking for), would you be out there saying "Let's make 'em carry their own coffin up Boot Hill"? I don't think so.

I still contend that Napster supplies data pipework with management services. For the last time, the fact that Napster only transports MP3 files is not in and of itself illegal!

If Napster is to be shut down, it will not be because the company acted illegally (for which there is no evidence that they have done so). By way of another analogy: Napster could be thought of as a saloon on the edge of the nice side of town that is having its business license revoked because it is attracting the wrong element and the neighbors are getting cranky.

Now the bigger issue raised by this is the question of whether the Internet is really, as per my analogy, a sort of municipality. Already we pay license fees (domain registration fees) and, at some point, taxes will be imposed, so who gets to make the laws?

The old analogy of cyberspace being like the Wild West of the Gold Rush is actually more applicable now than it has ever been. We've gone from basic survival (just getting onto the 'Net), through staking claims (businesses starting up) to establishing settlements (for example, any of the megacommunities such as Geocities) and now we're starting to get our towns organized.

Let's see, what's next on the normal course of Wild West evolution? Oh yeah, the marshal rides in and cleans up the town.

But hold yer horses! Who's the sheriff goin' to be?

Is it goin' to be some namby-pamby judge with about as much grasp of the facts as a jack rabbit has about the dangers of myxamatoxis?

(Buzz's horrendously over-the-top comment that he "believes the brilliance of Patel's ruling is matched only by its blinding obviousness" makes this cowboy wonder if he's trying to get a drawer full of speeding tickets cleaned up.)

Forget Napster, the governance and control of the 'Net is the motherlode — the fightin' over Napster and all of the other tussles are jus' the little flecks o' fool's gold on the ground. The danger is that while we are fixated on the shiny stuff on our boots, the real prize — control of the Internet — is being stolen from us piece by piece.

Darn it, I have to ride off into the sunset now, but never fear readers, The Lone Columnist will be back whenever trouble comes callin' in this purtty town.

Hi-ho IP, awwwwaaaaayyyyyy!

Telegraph messages to [nwcolumn@gibbs.com](mailto:nwcolumn@gibbs.com).



The latest on the  
Internet/intranet industry

Among the mistakes the FBI made with its controversial e-mail monitoring system was giving the thing such a scary name.

Sure, privacy hawks would have launched a jihad against this ham-handed software anyway. But, the general public and press may well have shrugged had **Carnivore** been called Urkel or Mary Poppins.

Opportunity is born of such mistakes, however. So this week a start-up called **Sigaba** is launching an e-mail encryption service with a ready-made media boost from the same fire that's roasting Carnivore.

(Trivia question: What is the origin of the name Sigaba? Clue: Think World War II. Answer below.)

There's nothing quite like the specter of **Uncle Sam** rummaging around your in-box to spur otherwise complacent folks to become jazzed about encryption.

"There are people like me who get on our knees every night and thank the Lord for the government being so inept," chuckles Sigaba marketing chief **Richard Bliss**.

Sigaba hopes to make the process of encrypting e-mail so easy — for end users as well as network managers — that the days of private messages running around the Internet buck naked will quickly end. The start-up has begun distributing a free plug-in for selected e-mail clients — Outlook 2000, Eudora, Yahoo Mail and Hot Mail, with more coming — that lets users send encrypted e-mail "without changing their behavior," Bliss says.

Actually, users will need to hit a "send secure" button instead of the normal "send" tab, but you get the point.

"What happens on the back end is that it makes [a Secure Sockets Layer] call to our server that's running out on the Internet to pick up an encrypted key," Bliss says. "Then it encrypts the message and delivers it as a normal message." If the recipient doesn't have the Sigaba plug-in, a trip to the Sigaba Web site will be in order to open the message.

The client plug-ins are just Sigaba seeds. The company plans to make money by selling a service to corporate customers who will define their own encryption policies that will be enforced at the server level by Sigaba software.

Bliss envisions a 500-employee company paying \$1 per month per employee.

On the start-up's board are longtime IBM futurist **John Landry** and **Pavan Nigam**, who co-founded Healtheon with **Jim Clark** of Netscape fame. If they think Sigaba is worth their time, it's worth a look.

**Buzz received** a brazenly unencrypted e-mail from **Jeff Bezos** recently. He wanted to know what I think of a plan to reconfigure the navigational tabs on the world's most famous electronic storefront. Naturally, I was flattered to be asked, as I'm sure were the zillions of other Amazon.com customers who received the same e-mail.

The new design looks spiffy, too. Fewer tabs. Simpler layout. . . . Simple is good.

Of course, those of us to whom Jeff turned would have been better able to offer advice if only the Amazon.com demo site was actually navigable, instead of merely providing pretty screen captures. You can only tell so much from kicking tires.

**Speaking of famous Jeffs** and simplicity, you might want to check out [www.jeffbridges.com](http://www.jeffbridges.com) to see how simplicity can be abused. Much of the site is presented in a handwritten scrawl, presumably the actor's own.

At first you might find the technique clever. After 30 seconds, though, you're thinking it's tedious and hard to read. It won't be much longer until you're rooting for this celebrity site to meet the same fate that befell the Bridges character at the end of "Arlington Road."

(Trivia answer: The Sigaba Machine was the Allies only encryption device that was never compromised.)

Send mencrypted tips and comments to [buzz@nwm.com](mailto:buzz@nwm.com).



PAUL  
MCNAMARA





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